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ABSTRACT

As part of the Science Council of Canada's investigation of Canada's scientific and technical contribution to world food supply, a background study was conducted on the role of the Canadian university sector. The objectives were threefold: to determine the extent and nature of the involvement of Canadian universities during the past ten years in helping developing countries solve their food problems; to review critically the results of these activities in order to identify the kinds of programs universities should concentrate on in the future; and to identify changes needed to make more comprehensive and effective use of Canadian universities in cooperation with international research and development agencies. The findings and recommendations pertaining to educational programs which focus on training of people in and from developing nations, projects, faculty resources, and research and development organizations are summarized. (Author/DC)

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Partnership in Development

Canadian Universities and World Food

William E. Tossell

Science Council of Canada

Background Study 45

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Partnership in Development

Canadian Universities and World Food

August 1980

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Partnership in Development

Canadian Universities and World Food

By William E. Tossell

William Tossell, Professor of Crop Science and Dean of Research, University of Guelph, took his BSA (1947) and MSA (1948) degrees at the University of Toronto. He gained his PhD (1953) from the University of Wisconsin with specialization in plant breeding and genetics. Subsequently he joined the faculty of the Ontario Agricultural College and successively was Chairman of the Department of Crop Science, Associate Dean of that college, and Dean of Research of the University of Guelph. As a Nuffield scholar, Dr. Tossell was a visiting professor at Cambridge University in 1973–74. He has been president of the Canadian Society of Agronomy and the Canadian Association of University Research Administrators.

Dr. Tossell has been involved with international development since the late 1960s. He has participated in activities of International Development Research Centre throughout the life of the centre and has been associated with programs of International Agricultural Research Centre system. He served as a member of the Canadian Advisory Committee for the Cassava program centred at the International Centre for Tropical Agriculture, Colombia. In addition he has acted as a consultant to CIDA and assisted the Canadian UNESCO Commission.

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Foreword

Hunger and starvation are among the worst scourges known to mankind. Most projections over the past twenty years have indicated that the number of people suffering from severe hunger is likely to increase, probably very dramatically, unless preventive measures are taken. Canada has been playing a role in staving off prospective disaster through its international assistance program.

Experience has shown that it is extremely difficult for the helping nations to set up and to evaluate truly effective assistance programs. The Science Council of Canada decided it could contribute by considering ways to improve Canada's scientific and technological assistance in the areas of food, agriculture, and fisheries. A Study Committee on Canada's Scientific and Technological Contribution to World Food Supply was established in October 1976, under the chairmanship of Dr. Clayton M. Switzer.

Quite early in its work, the Committee recognized the crucial importance of specially-trained people, stemming from the realization that the production of food close to the areas of consumption is the most important element of a secure food supply. Whenever innovations in the production, processing, storage and distribution of food are necessary, trained people are also needed. In the long term, these must be the local people, but the initial impetus often has to be provided by personnel from the donor countries. Success depends upon the availability of personnel who understand which innovations can succeed and who then become the indispensable human links in the process of technology transfer and the development of a relevant infrastructure. The universities can play a major role by assisting people in the developing countries to acquire the scientific and technical skills necessary for self reliance in food, provided the universities' scope of expertise includes familiarity with the needs of developing countries.

Dr. William E. Tossell, Dean of Research at the University of Guelph, is a leading member of the growing number of Canadian academics with a deep personal involvement in development assistance in relation to the food system. He was invited, therefore, to prepare this review of the past record and future potential of our universities in Canada's contribution to food system development.

As an authored paper, this publication presents the findings and opinions of its author. The degree to which these opinions will be endorsed by Council has yet to be determined; however Dr. Tossell's study has been deemed to merit immediate publication in the Science Council's series of Background Studies.

Maurice L'Abbé
Executive Director
Science Council of Canada

Summary of Major Recommendations

This study assesses the contribution of Canadian universities during the past decade in assisting developing countries to become self-reliant in food. Suggestions are put forward regarding the role of Canadian universities in the next decade. This summary concentrates on the major recommendations.

All Canadian universities with faculties or colleges of agriculture, veterinary medicine, and home science, and those with major fisheries groups should be concerned with the global food problem, and consequently should be deeply involved in food-system development assistance activities in cooperation with developing countries. For the purposes of this study, the food system includes agriculture, fisheries, rural development, and human nutrition.

Demands on the limited resources of universities will continue to be heavy; consequently, universities should establish priorities and concentrate their assistance to developing countries in the following four areas: building indigenous university capability, collaborative development research, general development projects, and public awareness in Canada.

The most important activity is to assist universities in developing countries to become self-reliant at both undergraduate and graduate levels and in research and outreach related to development needs. For the next decade it will remain necessary for Canada to provide graduate education for students from developing countries and regions where local facilities are inadequate. However, in order to maintain the focus on development during the educational period, Canadian graduate programs should place emphasis on thesis research in the home country or region, and the curricula should include at least one course on the development process and on the research and outreach strategies needed for development.

An increasing percentage of requests for assistance to strengthen the universities in developing countries will be for projects dealing with special topics, rather than projects intended for comprehensive university development. The Canadian International Development Agency (CIDA) should pay increasing attention to such requests, and Canadian universities should continue to respond to a portion of them.

Second in importance for Canadian universities is development research in collaboration with the International Agricultural Research Centres (IARCs), with regional and national research centres, and with universities in developing countries. This research will be required and requested by such institutions to advance their programs. It is recommended that the International Development Research Centre (IDRC) strongly support the Canadian universities in such development research in collaboration with developing country institutions.

The Canadian public needs to be better informed on development needs related to the world food problem, and of the role Canada and Canadians could play. Canadian universities should collaborate closely with non-governmental organizations (NGOs) to coordinate and expand the activities of both groups in public awareness related to food-system development.

Faculty resources in food-system specializations are inadequate to meet current needs and it is crucial to the Canadian development effort that steps be taken immediately to correct this deficiency.

The most urgent of the recommendations made about resources is that CIDA should provide continuing funds for 25 additional faculty person-years in specializations identified by CIDA as deficient, and that these be allocated to Canadian universities and made available for CIDA programs.

To make the best use of scarce university faculty resources, faculties and colleges of agriculture and veterinary medicine should consider establishing a consortium to coordinate their activities in university-building projects, in special programs of the short-course and workshop type, and in other carefully selected general development projects. In addition, a network should be established in the post-production sector of the food system, building on the present links between the University of Alberta and IDRC and between Laval and the United Nations University. The possibility of establishing a university consortium in fisheries should also be explored.

Problems encountered in the past in the implementation and administration of projects require attention. Universities need to pay greater attention to their arrangements for the administration and management of assistance projects. The International Development Office (IDO) could assist by arranging a workshop to pool and disseminate information on this matter, drawing upon the experience of the most successful projects. Universities that are deeply involved in international activities should establish an international office, and thus provide a reservoir of accumulated experience to assist faculty in new projects and provide a link with IDO.

Similarly, CIDA project administration and management needs attention. It is important that CIDA consider as urgent the rapid implementation of its intention to establish sectoral specialists in the area divisions of the Bilateral Branch. In addition, the number of food-system specialists in Ottawa should be increased, and special courses should be designed to provide more background on the food system to general development officers. The number of CIDA field officers who are food-system specialists should be increased, and they should operate from regional offices to supervise food-system projects throughout a region. Also, CIDA needs to provide greater continuity in project administration.

The basic mechanism for development projects involving the universities should be direct links between one institution and another, based on the concept of partnership and mutual benefit. This model should be used by CIDA for all university projects and by IDRC in its new initiatives for greater participation by Canadian universities in development research

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Acknowledgements

Agriculture and fisheries have played major roles in the development of Canada and have always had an international aspect. It is, therefore, not surprising to find a dedicated group of professionals in Canada – in CIDA, IDRC, the universities, government departments, the NGO sector, and private enterprise – who have a deep concern about the world food problem and the people it affects, and furthermore who are doing something about it. This group was extremely helpful in providing information and advice. Special appreciation is extended to the administation and staff of CIDA and IDRC for providing information for one more study; to Walter Watson, James Donnelly, and Dev Uppal, of the student and faculty sections of the Education, Science and Culture Division of Statistics Canada, for special work in extracting data; to Norberto Ison of the Institute of Computer Science, University of Guelph, for his help in analyzing the questionnaire results; to Charles Beaubien of the Science Council of Canada for continuous assistance during the study; to Margot Alderdice of the Office of Research, University of Guelph, and to Margaret Dorning of the Science Council for assistance in the preparation and editing of the manuscript.

William E. Tossell
Dean of Research
University of Guelph

Abbreviations

AUCC	Association of Universities and Colleges of Canada
CANSAVE	Canadian Save the Children Fund
CBIE	Canadian Bureau for International Education
CCIC	Canadian Council for International Cooperation
CESO	Canadian Executive Service Overseas
CGIAR	Consultative Group for International Agricultural Research, World Bank
CIAT	International Centre for Tropical Agriculture
CIDA	Canadian International Development Agency
CIMMYT	International Maize and Wheat Improvement Centre, Mexico
CUSO	Canadian University Service Overseas
DANIDA	Danish International Development Agency
DRIPP	Développement régional intégré de Petit Goâve et Petit Trou de Nippes, Haïti
FAO	Food and Agriculture Organization, United Nations
GTZ	German Agency for Technical Cooperation
IAEA	International Atomic Energy Association
IARCs	International Agricultural Research Centres
IDO	International Development Office, AUCC
IDRC	International Development Research Centre
IFPRI	International Food Policy Research Institute
IGU	International Geographical Union
ISTC	Institute for Scientific and Technological Cooperation, United States
IUC	Inter-University Council for Higher Education Overseas, United Kingdom
LCID	Liaison Committee for International Development
NSERC	Natural Sciences and Engineering Research Council (formerly a program under NRC), Canada
NGO	Non-Governmental Organization
NUFFIC	Netherlands Universities Foundation for International Cooperation
OAS	Organization of American States
ODM	Overseas Development Ministry, United Kingdom
OECD	Organisation for Economic Co-operation and Development
PAIGH	Pan American Institute of Geography and History
RAWOO	Advisory Council for Scientific Research in Development Problems, the Netherlands
SAREC	Swedish Agency for Research with Developing Countries
SIDA	Swedish International Development Association

SSHRC	Social Sciences and Humanities Research Council (formerly a program under the Canada Council), Canada
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development
WHO	World Health Organization

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I. Introduction

Canadian universities have completed two decades of substantial and increasing activity concerned with the food problems of developing countries. Much of this activity has been by way of participation in projects of CIDA and IDRC. In fact the Canadian effort, through CIDA, in assisting food-deficient countries to become self-reliant in food has been heavily dependent upon the resources of Canadian universities.

In light of the significance of the universities to the Canadian development effort, it is appropriate that the Science Council of Canada, in its study of Canada's scientific and technical contribution to world food supply, decided that a background study was required on the role of the Canadian university sector. The objectives were threefold: to determine the extent and nature of the involvement of Canadian universities during the past ten years in helping developing countries solve their food problems; to review critically the results of these activities in order to identify the kinds of programs universities should concentrate on in the future; and to identify changes needed to make more comprehensive and effective use of Canadian universities in cooperation with CIDA and IDRC.

The Development Setting

The food problem is one of the most urgent facing the poor countries in their struggle to meet the basic human needs of their people. It is estimated that over 1.3 billion people in the developing world are too poor to have an adequate diet[1] and that 500 million of these suffer from a significant degree of malnutrition.[2] People who cannot obtain enough food and a reasonably balanced diet are subject to hunger, malnutrition, increased health problems and a shortened life span. They suffer.

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The magnitude of the problem was evaluated in an International Food Policy Research Institute (IFPRI) study, in which the 1975 food supply and deficits were assessed in 77 developing countries, and projections were made to 1990.[3] (See Figure I.1.) If the rate of increase in food production experienced during the 1960-75 period continues until 1990, the gap between production and consumption will widen three to four times its size in 1975, depending upon the growth in income level assumed. In the low-income countries the gap in 1990 will have widened five to seven times that of 1975. And for this group, even if food consumption per capita in 1990 is projected at the same level as in 1975, the gap in 1990 would be three times that of 1975.

The most serious food-deficit problems are concentrated in low-income countries.[4] Forty per cent of the projected total deficit in the 77 countries is in Asia, 25 per cent in North Africa and the Middle East, 20 per cent in sub-Sahara Africa and 10 per cent in Latin America. The projected situations in those countries with the most severe problems are listed in Table I.1.[5] Deficits of 30 to 46 times current deficit levels, projected for countries such as Nigeria, Bangladesh, the Sahel group, Bolivia and Haiti, indicate the staggering order of the food problem faced by the poorest countries. A review of the 1979 situation by the World Food Council indicates no significant change from the 1977 IFPRI projections.[6]

It is now generally accepted that assistance to increase self-reliance in food production is the approach most likely to effect major and lasting improvement in food supply. Before 1970, attention was generally concentrated on the improvement of conventional agricultural systems, and these improved systems have played a significant role in increasing food supply as well as in generating foreign

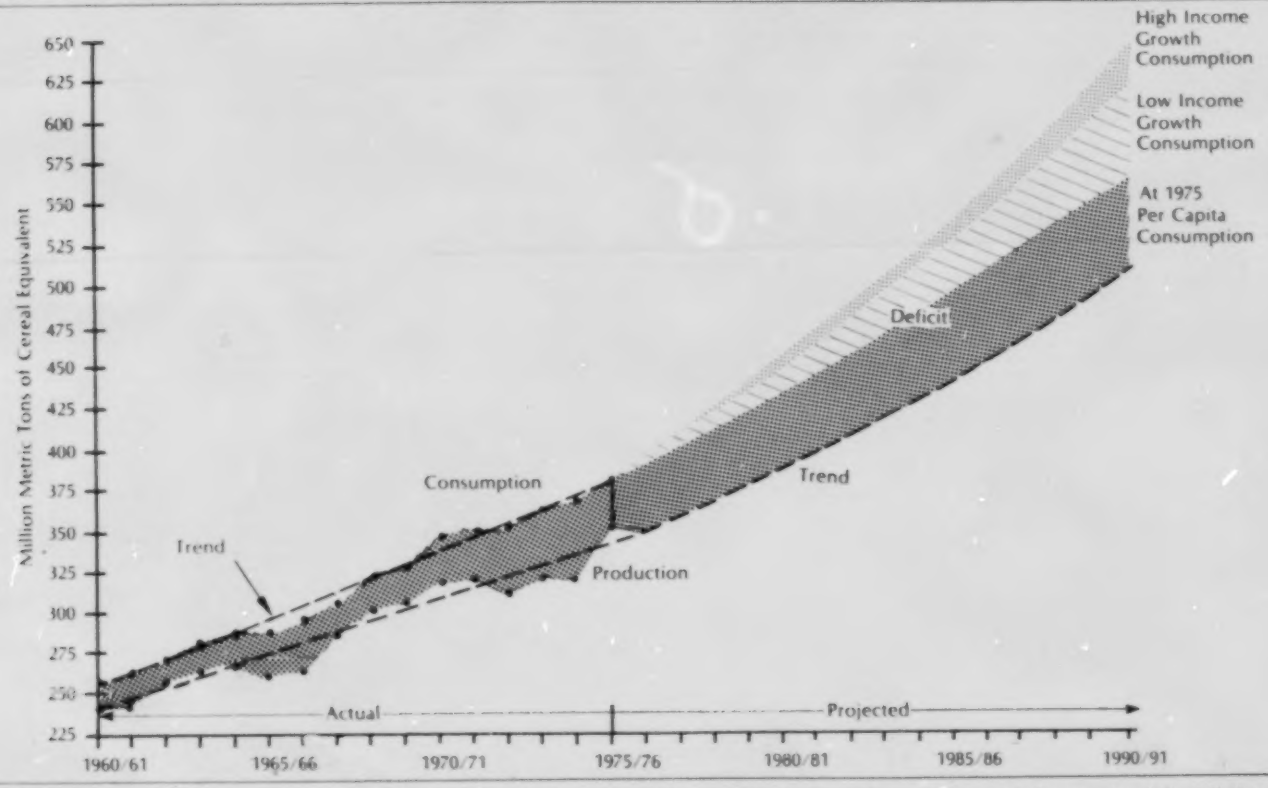
Table I.1 – Food Deficits as a Percentage of Consumption for Selected Developing Countries

	Actual 1975	Projected 1990
India	1	10–12†
Nigeria	2	35–39
Bangladesh	7	30–35
Indonesia	8	14–17
Egypt	35	32
Sahel group	9	44–46
Ethiopia	2	26–28
Burma	(7)*	21–25
Philippines	4	11–13
Afghanistan	–	19–22
Bolivia and Haiti	24	35–38

* surplus.

†for low and high income estimates.

Figure I.1 – Food-Deficit Developing Countries: Production and Consumption of Major Staples, 1960-75, and Projections to 1990



Source: Food Needs of Developing Countries: Projections of Production and Consumption to 1990, Research Report 3, International Food Policy Research Institute, Washington, DC, December 1977, p. 45.

exchange. In recent years, the small-farm sector has received growing attention as development strategy focussed increasingly on people and their basic needs. Improvement in food production for the masses of people living in rural areas, where agriculture is based on small farms, is a major challenge. Here improvement in food production systems is inseparable from the process of rural development. And rural development, complex in itself, is an integral part of the whole process of development in the country.

Between 1950 and 1970 countries generally recognized the food-deficit problem as a serious one, but often did not assign priority to finding a solution. Since then however, governments of developing countries, according to Wortman and Cummings,[7] have become increasingly aware of the urgent need to devote more attention to agriculture and rural development, based on:

"– an understanding that higher incomes among large numbers of rural people are fundamental for general economic advance, for enhancing rural standards of living, and for enlarging domestic markets for products of urban industry;
– a desire, insofar as possible, to be self-sufficient in food supplies and to be insulated from international uncertainties;
– a wish to spend less foreign exchange on farm products that could be produced within the country, thereby increasing employment of the rural people;
– a fear that neglect of rural populations will lead to unrest and violence;
– a realization that agricultural progress can be rapid."

This study, which is focussed on the food sector, deals with only one aspect of the broad subject of development:* a crucial aspect in relation to meeting the basic needs of the world's poor. The food problem centres on agricultural and fisheries development and, therefore, on rural development; yet it also reaches into the urban sector in a significant way. Successful development in rural areas will result not only in increased food supply for both rural and urban people, but also in increased income for rural people and increased employment opportunities in industries servicing agriculture, with

*"Development, at the most, is what sovereign independent governments can make it. Their objectives differ from country to country; and the many objectives of a single government may be less than fully consistent with one another. However, governments usually declare that they wish to improve the human condition in their countries, to lessen poverty and inequality, and to remove the economic and social constraints which restrict the creative energies of their people. They wish to produce more food, more raw materials, more employment, more housing, more roads, more power, more irrigation, more clean domestic water, more material goods, more education, more health, more social services; and perhaps out of all this they, and we, may hope that the people will, in the end, be more free than they are now to pursue happiness." A.H. Bunting, "Science and Technology for Human Needs: Rural Development and the Relief of Poverty," OECD Workshop on Scientific and Technological Cooperation with Developing Countries, April 1978, p. 1.

a consequent effect on the general economic development of the country.

Success in effecting sustainable improvements in the food situation of developing countries is dependent upon the integration of many related considerations; hence, it is appropriate to deal with food as a system. The greatest opportunity for success in improving the food situation will occur when plans for improving this "food system" are made as an integral part of a total development plan for the country. The components of the food system, as defined for this study, are:

Agriculture – All aspects of the production of agricultural commodities, including related aspects such as planning for agricultural production, land inventory and development, water supply, irrigation, drainage, transport, storage, processing, marketing, financing the system, technology development and transfer, extension services and social and environmental impacts.

Fisheries – All aspects of marine and fresh water fisheries and aquaculture,* including planning for fisheries development, management systems to sustain the resources, processing, storage, transport, marketing, financing the system, technology development and transfer, and social and environmental impacts.

Rural Development – All aspects of development that improve the living conditions and quality of life for rural people and the productivity of the rural sector.

Food and Human Nutrition – Nutritional surveys, nutritional requirements and diet formulation, international and national policy and program planning for food supply and food strategy, food processing for new or modified products, product development, information and promotion in national and local programs to improve diets, food distribution systems, relationship with health problems, technology transfer, and social impacts.

It is important to note that the food system, as defined above, involves a large number of the disciplines and professional fields within a university. Faculties and colleges of agriculture and of veterinary medicine are predominantly concerned with the food system and are central to it. Similarly, departments of zoology and biology are central to fisheries and aquaculture. But many other subjects are critical to the food system: nutrition, public health, engineering, ergonomics, geography, economics, planning, sociology, anthropology, consumer studies, family studies, education, communications and information systems, ecology and environmental studies, and

*Culture of aquatic animals in fresh or brackish water.

Canadian university activity in international development began about 1960, primarily as the result of the establishment of the Commonwealth Scholarship and Fellowship Plans.[8] These plans, together with Canada's participation in the Colombo Plan, started the first organized flow of students from developing countries to Canadian universities.

In 1965, the first major technical assistance project dealing with the food system was undertaken by a Canadian university as the executing agency. The University of Manitoba assisted in the establishment of a new faculty of agriculture at Khon Kaen University in Thailand. Canadian universities have been deeply involved since that time, especially since 1970. In most cases, university involvement grew as an *ad hoc* response to requests from the aid agencies rather than as a consequence of university planning.

Methodology

The methodology used in this study is set out in Appendix A. The data on university involvement are for the period from 1968 to 1978. During the course of the study, information was collected from 532 faculty members in 33 universities. Interviews were held with 40 CIDA and IDRC personnel, with members of NGOs involved in development, with faculty members who had participated in selected projects, and with cooperators and officials in developing countries with respect to selected projects.

Chapter II presents an analysis of the involvement of Canadian universities in the provision of formal undergraduate and graduate programs for students from developing countries. An inventory of projects in which Canadian university faculty members participated is presented in Chapter III, together with an assessment of the relative success of various types of projects. Chapter IV deals with an inventory of Canadian university faculty resources available to assist with development projects. The policy and structural arrangements affecting Canadian university participation in food-system assistance to developing countries are discussed in Chapter V. Finally, Chapter VI contains suggestions for improving the potential contribution of Canadian universities to the food systems of developing countries.

II. Education for Development

Without adequate scientific, technical, and management capability, development must proceed slowly. Education at all levels in developing countries is important, eg., the literacy, skills, technical, undergraduate, and graduate levels. Universities, as one component of the educational system, can play an important role in the development of people with basic scientific and technical knowledge and the essential background to develop management abilities. University education, in addition to developing the individual, can be important in the direct transfer of knowledge and technology to developing countries.

Canadian universities contribute to the training of people in developing countries in a number of ways; some examples are undergraduate and graduate programs, special non-degree courses and workshops in Canada and abroad, and participation in the development of educational institutions in developing countries.

Undergraduate Degree Programs

It is significant to note that almost half (20 425) of the non-Canadian undergraduate students in Canadian universities in 1978 came from developing countries. (Table II.1.) Of this number 302, or 1.5 per cent, were visa or landed immigrant students in the food-system programs, and nearly all of these were in bachelor or first professional degree programs. (Table II.2.) In interpreting these statistics, it should be kept in mind that only the numbers of students in agriculture and veterinary medicine programs were available; so the data underestimate the total number studying in the food system. Even if this number were to be increased by as much as 50 per cent, it is still clear that enrolments in food-system programs account for

a very small fraction of the students from developing countries studying in Canadian universities.

Statistics for the faculties and colleges of agriculture and veterinary medicine reveal that in 1978, 3.6 per cent of the undergraduate students were from developing countries: almost all of these students were enrolled in degree programs in 1978. (Table II.3.) Slightly less than two-thirds were visa students and the rest were landed immigrants. Although the total number of students is relatively small, it probably more than doubled between 1973 and 1978 (Table II.4), even allowing for the possibility that the 1973 numbers are probably underestimated by about 20 per cent. On the basis of Statistics Canada data,[1] the number of students from developing countries appears to have levelled off during the past two years.

One other important change that occurred between 1973 and 1978 is the increase in the percentage of students from the high-income countries. (Table II.5.) In 1973 nearly half of the undergraduate students came from the low-income countries, whereas in 1978 half came from the high-income group. (Table II.5.) Hong Kong and Malaysia account for 49 and 27 students respectively out of a total of 189 in the high-income group. (Table II.6.) These groups of students are concentrated in the food science specializations and in "other agriculture" in the specializations listed in Table II.7. The educational opportunity offered to the high-income group is important to the individual, but is not significant in terms of Canadian university contribution to development.

The number of undergraduate students from developing countries in Canadian universities is relatively small and there seems no good reason to encourage an increase. Provided students have access to undergraduate programs in their own country, or in a country in their region, it seems appropriate that they obtain their undergraduate degrees there: the student thereby learns in the same environ-

Table II.1 – Undergraduate and Graduate Enrolment in Canadian Universities in 1978

Student group	Undergraduate	Graduate	Total
All students	510 090	65 258	575 348
All non-Canadian students	46 164	13 919	60 083
All students from developing countries*	20 425	5 511	25 936
Students from developing countries in food-system programs†			
Visa and landed immigrant	302	370	672
Visa	189	277	466

*Visa and landed immigrants.
†Agriculture and veterinary medicine only.
Source: Statistics Canada, Education, Science and Culture Division, data extracted from the University Student Information System (USIS) data base; Statistics Canada, Fall Enrolment in Universities, 1977-78, Cat. no. 81-204, Annual, Education, Science, and Cultural Division, 1978.

Table II.2 – Number of Developing Country Visa Students in Food-System Programs at Canadian Universities, by Developing Country Group and Region

	Developing Country Group					Regional Group				
	Food deficit			Grain exporters						
Program	Low income	Middle income	High income		Total	Asia	North Africa and Middle East	Sub-Sahara Africa	Latin America	Total
Undergraduate										
Bachelor and first professional degree	46	45	94	—	185	77	13	47	48	185
Diplomas and certificates	1	—	—	1	2	1	—	1	—	2
Other	1	—	1	—	2	1	—	1	—	2
Sub-total	48	45	95	1	189	79	13	49	48	189
Graduate										
Masters	60	50	28	6	144	34	20	53	37	144
Doctoral	59	39	17	7	122	37	19	47	1	122
Diplomas and certificates	—	—	—	—	—	—	—	—	—	—
Other	5	3	3	—	11	2	3	5	1	11
Sub-total	124	92	48	13	277	73	42	105	57	277
Total undergraduate and graduate	172	137	143	14	466	152	55	154	105	466

Source: Statistics Canada, Education, Science and Culture Division.

Table II.3 – Enrolment in Faculties and Colleges of Agriculture and Veterinary Medicine in 1978

	Total Number of Canadian and Non-Canadian Students	Developing Country Students (%)	
		Visa	Visa and Landed Immigrant
Undergraduate*			
Bachelor and first professional degrees	7 135	2.6	4.0
Diploma	1 260	0.3	1.1
Sub-total	8 395	2.2	3.6
Graduate			
Masters	1 050	13.7	20.1
Doctoral	376	32.4	39.1
Diploma and certificate	38	—	—
Sub-total	1 464	18.9	25.3
Total undergraduate and graduate	9 859	4.7	6.8

*Forestry excluded.
Source: Association of Faculties and Colleges of Agriculture and Veterinary Medicine, Annual Meeting, Truro, Nova Scotia, October 1977.

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Table II.4 – Number of Developing Country Students in Food-System Programs at Canadian Universities, by Citizenship Status

	Visa		Visa and Landed Immigrant	
	1973	1978	1973	1978
Undergraduate				
First degree	70	185	99	288
All undergraduate	73	189	102	302
Graduate				
Masters	46	144	81	211
Doctoral	47	122	91	147
All graduate	100	277	184	370
Total	173	466	286	672

Source: Statistics Canada, Education, Science and Culture Division.

Table II.5 – Developing Country Students in Canadian Universities in Each of the Developing Country Groups, by Percentage

Year and Developing Country Group	Undergraduate	Visa Graduate		
	All Programs	Masters	Doctoral	Total
1973				
Food deficit				
Low income	46	41	60	51
Medium income	22	15	17	16
High income	32	20	15	17
Grain exporters	—	24	8	16
Total	100	100	100	100
1978				
Food deficit				
Low income	25	42	48	45
Medium income	24	35	32	34
High income	50	19	14	17
Grain exporters	1	4	6	5
Total	100	100	100	100

Source: Statistics Canada, Education, Science and Culture Division.

ment in which he or she will later work. Further, a student who takes an undergraduate degree, followed by graduate work, in a North American or European setting may be away from his or her home country for up to eight years, with all the attendant problems of readjustment upon return to the home country. Such problems often may well persuade the student to emigrate. A large number of faculty in responding to the questionnaire indicated they thought that undergraduate places in Canada for students from developing countries should not be increased. Bentley strongly advocates this view.[2]

Table II.6 – Number of Developing Country Students in Food System Programs at Canadian Universities, by Country within Developing Country Group

Developing Country	Visa 1978			Visa and Landed Immigrant 1978			Visa and Landed Immigrant, 6-year average 1973-78
	Undergraduate*	Grad*	Total	Undergraduate	Grad	Total	Graduate
Food Deficit, Low Income							
Bangladesh	—	3	3	—	3	3	1
Burma	—	—	—	—	—	—	0.3
India	2	20	22	7	33	40	39
Indonesia	—	1	1	—	2	2	1
Nepal	—	—	—	—	—	—	—
Philippines	—	6	6	1	6	7	4
Sri Lanka	—	9	9	—	9	9	7
Afghanistan	—	—	—	—	—	—	—
Total Asia	*2*	*39*	*41*	*8*	*53*	*61*	*52*
Egypt	—	10	10	4	22	26	13
Sudan	—	1	1	—	1	1	2
Yemen PDR	—	—	—	—	—	—	—
Total North Africa/ Middle East	—	*11*	*11*	*4*	*23*	*27*	*14*
Nigeria	11	17	28	12	18	30	18
Sahel							
Chad	—	—	—	—	—	—	—
Mali	1	2	3	1	2	3	2
Niger	1	—	1	1	—	1	—
Senegal	—	1	1	—	3	3	1
Upper Volta	3	2	5	7	6	13	3
Benin	3	1	4	4	1	5	1
Cameroon	—	1	1	—	2	2	1
Gambia	—	1	1	—	1	1	0.2
Guinea	—	—	—	1	—	1	—
Sierra Leone	1	2	3	1	2	3	1
Ethiopia	4	11	15	4	11	15	8
Kenya	1	9	10	3	9	12	5
Tanzania	9	5	14	9	8	17	6
Uganda	3	18	21	5	20	25	14
Zaire	1	—	1	1	—	1	—
Burundi	1	—	1	1	—	1	—
Malagasy	1	—	1	1	—	1	—
Malawi	2	1	3	2	1	3	2

Table II.6 cont'd

Rwanda	—	—	—	—	—	—	1
Somalia	2	1	3	2	1	3	1
Total Sub-Sahara Africa	*44*	*72*	*116*	*55*	*85*	*140*	*64*
Bolivia	—	1	1	—	1	1	1
Haiti	2	1	3	5	1	6	1
Total Latin America	*2*	*2*	*4*	*5*	*2*	*7*	*2*
Total Low Income	48	124	172	72	163	235	131
Food Deficit, Middle Income							
Morocco	1	1	2	1	3	4	1
Turkey	—	2	2	—	2	2	1
Cyprus	—	1	1	—	1	1	1
Jordan	—	2	2	1	2	3	1
Lebanon	4	3	7	16	6	22	2
Syria	—	—	—	—	1	1	1
Tunisia	—	—	—	—	1	1	0.3
Total North Africa/ Middle East	*5*	*9*	*14*	*18*	*16*	*34*	*6*
Ghana	2	28	30	4	29	33	20
Angola	—	—	—	—	—	—	—
Ivory Coast	1	—	1	1	—	1	0.2
Liberia	—	—	—	—	—	—	—
Mozambique	—	—	—	—	—	—	—
Zimbabwe	—	1	1	—	1	1	0.3
Zambia	2	4	6	2	4	6	2
Total Sub-Sahara Africa	*5*	*33*	*38*	*7*	*34*	*41*	*22*
Brazil	2	10	12	2	10	12	4
Chile	—	1	1	9	11	20	4
Colombia	1	7	8	1	7	8	2
Ecuador	—	—	—	—	—	—	—
Mexico	2	14	16	2	15	17	9
Peru	1	—	1	1	3	4	2
Costa Rica	—	—	—	—	—	—	—
Cuba	—	1	1	—	1	1	1
Dominican Republic	1	—	1	1	—	1	—
El Salvador	—	—	—	—	—	—	—
Guatemala	1	—	1	1	—	1	—
Guyana	7	7	14	18	9	27	6
Honduras	—	—	—	1	—	1	—

Jamaica	8	4	12	12	7	19	5
Nicaragua	1	—	1	1	—	1	—
Panama	—	1	1	—	1	1	1
Paraguay	—	—	—	—	—	—	—
Trinidad and Tobago	11	5	16	20	9	29	7
Total Latin America	*35*	*50*	*85*	*69*	*73*	*142*	*40*
Total Middle Income	45	92	137	94	123	217	68
Food Deficit, High Income							
China, Republic	—	5	5	2	7	9	15
Hong Kong	49	3	52	79	13	92	12
Korea, Republic (South)	—	3	3	2	5	7	3
Malaysia	27	10	37	28	13	41	13
Singapore	—	—	—	1	1	2	2
Total Asia	*76*	*21*	*97*	*112*	*39*	*151*	*45*
Algeria	1	2	3	1	2	3	1
Iran	7	9	16	9	12	21	9
Iraq	—	10	10	—	10	10	6
Libya	—	—	—	—	—	—	—
Saudi Arabia	—	1	1	—	1	1	1
Total North Africa/ Middle East	*8*	*22*	*30*	*10*	*25*	*35*	*17*
Venezuela	11	5	16	11	5	16	2
Total High Income	95	48	143	133	69	202	64
Grain Exporters							
Pakistan	—	8	8	1	8	9	7
Thailand	1	5	6	2	5	7	7
Total Asia	*1*	*13*	*14*	*3*	*3*	*16*	*14*
Argentina	—	—	—	—	2	2	1
Surinam	—	—	—	—	—	—	—
Uruguay	—	—	—	—	—	—	0.2
Total Latin America	—	—	—	—	*2*	*2*	*1*
Total Grain Exporters	1	13	14	3	15	18	15
Grand Total	**189**	**277**	**466**	**302**	**370**	**672**	**278**

*Total of all undergraduate programs; total of all graduate programs.
Source: Statistics Canada, Education, Science and Culture Division.

Table II.7 – Number of Developing Country Visa Students in Food-System Programs at Canadian Universities in 1978, by Undergraduate Degree Program Specialization and by Developing Country Group and Region

Specialization	Developing Country Group					Regional Group				
	Food Deficit			Grain Exporters						
	Low income	Middle income	High income		Total	Asia	North Africa and Middle East	Sub-Sahara Africa	Latin America	Total
Agricultural economics	5	4	1	—	10	1	1	5	3	10
Soil science	1	—	4	—	5	2	—	1	2	5
Agrometeorology	—	—	—	—	—	—	—	—	—	—
Plant sciences										
Crop science	3	—	3	—	6	2	2	2	—	6
Plant science	—	1	2	—	3	1	—	—	2	3
Horticultural science	—	—	1	—	1	—	1	—	—	1
Weed science	—	—	—	—	—	—	—	—	—	—
Animal sciences										
Animal science	8	2	3	—	13	2	—	8	3	13
Poultry science	—	5	1	—	6	1	1	1	3	6
Veterinary science	1	6	—	—	7	—	—	1	6	7
Food sciences										
Dairy science	1	—	10	—	11	10	—	1	—	11
Food science	2	3	24	—	29	23	1	3	2	29
Apiculture	—	—	—	—	—	—	—	—	—	—
Agricultural entomology	—	—	—	—	—	—	—	—	—	—
Agricultural genetics	—	—	—	—	—	—	—	—	—	—
Agricultural microbiology	—	—	4	—	4	4	—	—	—	4
Agricultural science	—	—	—	—	—	—	—	—	—	—
Engineering										
Agricultural engineering	8	6	9	—	23	6	3	8	6	23
Other related engineering	—	3	2	—	5	2	—	—	3	5
Other agriculture	17	15	30	—	62	23	4	17	18	62
Total	46	45	94	—	185	77	13	47	48	185

Source: Statistics Canada, Education, Science and Culture Division.

If a developing country does not have suitable university undergraduate programs available locally or regionally, the resources of Canadian universities would generally be better used to assist in building this local or regional capability than in training the undergraduates in Canadian universities. It would be wrong, however, for universities to take the position that no undergraduate students from developing countries should be enrolled, because there are some situations in which undergraduate study in Canada is appropriate. Senegal, for example, has no faculty of agriculture and students have traditionally taken their first degree at institutions in France. Until a local or regional institution is developed, Laval is an alternative that could provide a choice of training systems for students from Senegal. Also, the door should always be open to those students who, for various reasons, choose to study abroad.

Diploma and Certificate Programs

The diploma programs in agriculture offered at Canadian universities are generally not suitable for students from developing countries because they are designed to meet the needs of the Canadian food system at the operating level, and therefore, have a high content of location-specific information. Technical training in agriculture at the sub-baccalaureate level is an important need in developing countries, but because of the location-specific content needed it is essential that a capability for such programs be established in the developing countries themselves or in the region.

However, the diploma and short-course programs in cooperative formation and in social development both at the Coady International Institute, St. Francis Xavier University, and at the Centre for Cooperative Studies, University of Sherbrooke, are of a different nature. These are well-recognized and successful programs for the development of leadership, using the cooperative model to effect development at the village level.

Over 2000 graduates from the Coady program, which has been operating for 50 years, are spread across 100 countries. This pool of expertise in cooperative formation and in development at the village level is a unique resource. The Coady program, established at a Canadian university, has no direct association with universities in developing countries.[3] Universities in these countries need to expand their involvement in outreach and adult education and to have closer ties at the grassroots level to strengthen their educational and research programs related to local needs. Therefore, it seems appropriate for the Coady International Institute, and perhaps for the Sherbrooke program, to attempt to develop three-way links among the Canadian university, the developing country university, and local centres connected with the Coady and Sherbrooke pro-

grams. These programs would assist universities in developing countries to establish closer working arrangements at the village level.

Cost Recoverable Programs

Paid – in contrast to aid – educational programs at the undergraduate level are a recent development, mainly affecting middle-income countries that have income levels too high to permit their participation in CIDA aid programs. But many of these countries, such as Nigeria, have a food deficit and do not yet have an adequate local educational capability. Universities should be cautious in their involvement in these programs of undergraduate training, especially in agriculture, because Canadian programs are designed for relevance to Canada; hence by definition, they are in most cases only marginally suited to students from developing countries. The real need, of course, is to strengthen university capability in the home country or region; therefore Canadian universities should not undertake cost recoverable undergraduate programs if this will reduce their capacity to participate in aid programs or cost recoverable programs in the graduate and technical assistance areas.

Graduate Programs

Although only 1.5 per cent of the students from developing countries in Canadian universities are in food-system programs, and only 3.6 per cent of the undergraduate enrolments in agriculture and veterinary medicine are from these countries, the picture differs markedly at the graduate level. (Tables II.1, II.3.) Here 6.7 per cent of all graduate students from developing countries in Canadian universities are in food-system programs and 25.3 per cent of all graduate students in agriculture and veterinary medicine are from developing countries. Even though the percentage of graduate students from developing countries in food-system studies is four times as high as the percentage of undergraduate students from these countries, at 6.7 per cent, it is still low. This suggests that developing countries are probably still not giving priority to needs related to the food system.

Three times as many students from developing countries have student visa status as have landed immigrant status. (Table II.3.) Because the visa students are committed to leave Canada when the visa expires, this group is the most likely to return to the home country. Therefore, in assessing the potential impact of graduate training in Canada, particular attention should be paid to the visa students.

In 1979, five faculties and colleges of agriculture produced data showing that "foreign students" ranged from 20 to 30 per cent of

masters enrolment and from 33 to 60 per cent of doctoral enrolments.[4] However, the base for reporting was not uniform; some universities included all non-Canadian students, some included all students from developing countries, and some included only visa students from developing countries. These 1979 data, combined with the general view that the percentage in most cases has not changed substantially over the previous two years, indicate that the proportions of 13.8 per cent for masters and 32.4 per cent for doctoral programs (Table II.3) are probably low. What is clear is that the number of graduate students from developing countries forms a very significant percentage of the total graduate enrolments in faculties of agriculture and veterinary medicine in Canadian universities.

Growth has been substantial during the period from 1973 to 1978 at both the masters and doctoral levels (Table II.4), but the numbers appear to have reached a plateau.[5] Visa students, who in 1973 represented slightly more than half the total number of students from developing countries, now account for three-quarters of the graduate enrolment. (Table II.4.) A higher percentage (79 per cent) of students in graduate programs came from the low- and medium-income countries in 1978 compared to 1973. (Table II.5.) This is in healthy contrast with the situation at the undergraduate level. Also, it is important to note that graduate numbers are highest from sub-Sahara Africa and Asia; the two general areas with the most severe food problems. (Table II.6.) This student distribution pattern reflects, to a large measure, the policies of CIDA and IDRC in emphasizing, through their training and development assistance projects, support programs for the low- and middle-income developing countries.

The distribution of students by specialization in graduate programs indicates a broad coverage, with the largest concentration being in agricultural and related engineering (49),* plant sciences (47), animal sciences (43), soil science (32), agricultural economics (32), veterinary science (25), and food sciences (19). (Tables II.8, II.9.)

It is important to understand the history of graduate training for foreign students in Canadian universities in order to appreciate the current debate on the present and future roles of the universities in this matter. During the 1960-70 decade, Canadian universities accepted graduate students in increasing numbers in response to two forces. One force was external: Canadian government external aid policies, together with the policies of other aid agencies, were to finance an increasing number of students and the universities were expected to accept them. Unfortunately, the universities had not

*Number of students.

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Table II.8 – Number of Developing Country Visa Students in Food-System Programs at Canadian Universities in 1978, by Masters Program Specialization and by Developing Country Group and Region

	Developing Country Group					Regional Group				
	Food Deficit			Grain Exporters						
Specialization	Low income	Middle income	High income		Total	Asia	North Africa and Middle East	Sub-Sahara Africa	Latin America	Total
Agricultural economics	12	5	1	—	18	2	—	13	3	18
Soil science	4	3	3	—	10	1	4	3	2	10
Agrometeorology	—	2	1	—	3	1	1	—	1	3
Plant sciences										
Crop science	4	4	1	—	9	2	1	5	1	9
Plant science	6	8	6	1	21	7	3	6	5	21
Horticultural science	—	—	—	—	—	—	—	—	—	—
Weed science	1	1	—	—	2	—	—	1	1	2
Animal sciences										
Animal science	7	8	2	1	18	4	—	9	5	18
Poultry science	—	—	—	—	—	—	—	—	—	—
Veterinary science	12	1	3	—	16	4	2	9	1	16
Food sciences										
Dairy science	1	—	—	—	1	—	1	—	—	1
Food science	2	3	3	—	8	3	1	—	4	8
Apiculture	—	—	—	—	—	—	—	—	—	—
Agricultural entomology	—	1	1	—	2	1	—	1	—	2
Agricultural genetics	—	1	—	—	1	—	—	—	1	1
Agricultural microbiology	—	—	—	—	—	—	—	—	—	—
Agricultural science	—	—	1	—	1	—	1	—	—	1
Engineering										
Agricultural engineering	7	6	—	4	17	7	1	6	3	17
Other related engineering	4	7	5	—	16	2	5	—	9	16
Other agriculture	—	—	1	—	1	—	—	—	1	1
Total	60	50	28	6	144	34	20	53	37	144

Source: Statistics Canada, Education, Science and Culture Division.

Table II.9 – Number of Developing Country Visa Students in Food-System Programs at Canadian Universities in 1978, by Doctoral Program Specialization and by Developing Country Group and Region

Specialization	Developing Country Group					Regional Group				
	Food Deficit			Grain Exporters						
	Low income	Middle income	High income		Total	Asia	North Africa and Middle East	Sub-Sahara Africa	Latin America	Total
Agricultural economics	8	4	—	2	14	7	—	5	2	14
Soil science	6	10	2	—	18	2	4	6	6	18
Agrometeorology	—	1	—	—	1	—	—	—	1	1
Plant sciences										
Crop science	4	3	—	—	7	3	—	4	—	7
Plant science	5	2	2	1	10	2	3	4	1	10
Horticultural science	1	—	—	—	1	1	—	—	—	1
Weed science	—	—	—	—	—	—	—	—	—	—
Animal sciences										
Animal science	12	6	3	2	23	7	2	12	2	23
Poultry science	2	—	—	—	2	1	—	1	—	2
Veterinary science	6	1	2	—	9	3	1	4	1	9
Food sciences										
Dairy science	2	—	2	—	4	1	2	1	—	4
Food science	2	3	1	—	6	1	1	3	—	6
Apiculture	—	—	—	—	—	—	—	—	—	—
Agricultural entomology	1	1	—	1	3	1	—	2	—	3
Agricultural genetics	1	—	1	—	2	1	1	—	—	2
Agricultural microbiology	—	1	—	—	1	—	—	—	1	1
Agricultural science	—	1	—	—	1	—	—	—	1	1
Engineering										
Agricultural engineering	5	1	1	1	8	3	1	3	1	8
Other related engineering	2	4	2	—	8	2	3	1	2	8
Other agriculture	2	1	1	—	4	2	1	1	—	4
Total	59	39	17	7	122	37	19	47	19	122

Source: Statistics Canada, Education, Science and Culture Division.

participated in the design and development of these assistance programs, which depended for success not only on the acceptance but also on the enthusiastic support of the universities. As a result, although the universities participated, it was often without enthusiasm, and the stage was set for problems. A second force was internal: as universities underwent rapid growth from the early sixties until the early seventies they were anxious to build up graduate programs. They saw an opportunity to capitalize on the influx of foreign students and on the increasing availability of Canadian research funds to expand and develop graduate schools. Frequently, this resulted in the emphasis being placed on building up graduate programs rather than on the needs of foreign students.

Another factor must be mentioned. During this period many foreign students, whether financed through an aid program or privately, saw the opportunity of graduate work in Canada as a stepping stone to relocation. Faculty members, after spending a great deal of time developing programs suited to the student, were deeply concerned and often discouraged when they saw student after student not returning to assist in development in the home country or region. Moreover, government policies on student selection for Canadian aid awards and government administrative procedures in dealing with the universities created difficulties.

Walmsley in 1970 identified the major problems and offered excellent recommendations for improvement, but the system was slow to respond.[6] Consequently, the most severe of the critics think that graduate training in Canada for students from developing countries has failed. In support of their position they point out that many students did not return to the home country, that many who returned were not effective because the training received, especially the research training, was inappropriate to the home country needs, resources, and setting, and that many, having lived in Canadian society, were unwilling or unable upon return to readapt to the special needs of the society in the home country. The critics therefore conclude that Canadian universities can do little to assist development by way of graduate training.

Such an extreme position, which is by no means rare, will not withstand close scrutiny. Lack of trained manpower is a major hindrance to the development of new or more appropriate food-system technologies and to the application of existing appropriate technologies in developing countries. In many cases it is the main hindrance.[7] Developing countries, as a group, do not yet have the university capacity to handle all the training needs in either the home country or another developing country. With few exceptions these countries, as they emerged from the colonial era, did not have the educational system in place to handle their needs.[8] Great strides have been made in the past decade, and the needs are very different

today from what they were in the mid-sixties. At present, however, and for at least the next decade, the developing countries need to draw upon the resources of countries like Canada for an important part of their graduate training needs. As local capability increases, the need will decline.

Most faculty members (73 per cent) would prefer the number of graduate students from developing countries that they supervise to remain at the current level; most of the rest prefer an increase, in spite of the fact that a high percentage of these students usually require substantially more supervisory time than Canadian students.

Because of the developing countries' need for graduates and in view of evident faculty interest, Canadian universities should continue to provide graduate training opportunities for a portion of the students from developing countries who are studying in programs related to the food system. Due emphasis should be placed in these programs on an orientation to development.

Indeed, orientation to development is essential. Thesis research projects should be related to development needs, and the students' learning environment should be conducive to development interests. Critical considerations for success are:

1. The university should have a stated policy and objective for its participation in programs for undergraduates and graduates, for technical assistance, and for other activities related to development. The study by the AUCC and the Royal Society of Canada recognized this need.[9] Without such a policy base it is unlikely that a university will be able to provide the kind of development-oriented graduate study deemed essential.

The current study survey shows that such policy statements are rare. For example, all university presidents were asked for the university preference regarding the number of developing country students specializing in food-system subjects that they wish to have enrolled in their universities in the future. Only ten responded to this question, including only three of the eight whose universities had faculties of agriculture and/or veterinary medicine. In most cases the response was an estimate made by one person and was not based on university policy.

2. The university should provide non-academic services to students from developing countries in recognition of the special needs associated with adjustment to a very different living and learning environment. If the university has a serious commitment to educational programs for developing countries, a foreign student adviser is essential; students make use of such an adviser in many ways.[10] Provision of an international house and encouragement of social and cultural interchange among international and Canadian students are other useful means of creating a suitable milieu for the foreign student.

3. Faculty members, in accepting the role of supervisor of a student from a developing country, should recognize the unique requirements to be fulfilled. More time is required to supervise the student than in a conventional course and thesis program, and a great deal more if the thesis research is in the home country. The supervisor should be sensitive to the adjustments that the student has to make, and careful fostering of a learning-teaching relationship between two people with different cultural backgrounds is also necessary.

4. Universities should consider introducing some formal activity to focus the attention of students from developing countries on the development process and on research and outreach strategy for development. The university should encourage these students to participate in such activity at some time during their graduate studies. The activity might take the form of a full course, short course, seminar series, or workshop.

5. For an increasing number of students, research will be done in the home country or region, or in Canada using material and data from the home country. Thesis research in the home country is a relatively new development, at least on a large scale. It is interesting that when faculty were asked if they thought thesis research in the home country should increase, 76 per cent of the 213 respondents said an increase was desirable. IDRC is promoting this arrangement for students enrolled in Canadian universities and, although CIDA's position on this subject is not clear, it is certainly promoting an increase in the proportion of third country training.

Thesis research in the home country usually takes the form of the student returning to his or her home country after part or all of the course work is completed, in order to conduct the research, and then returns to Canada to complete the thesis. There are three main advantages. First, the student is not away from the home country for a prolonged period and this allows maintenance of a continuous link with the home society; the student is therefore more likely to return home and remain there. Second, by conducting research in the home country or region, the student more quickly becomes known and established as a scientist at home, and this may reinforce his or her desire to stay. Third, the results of the research not only contribute to the development of the student as a scientist, but also contribute directly to the home country in the form of development.

These are powerful reasons in favour of increasing the practice, but it is also important to recognize the problems. In the context of the food system, the length of the training period may be prolonged if biological data must be collected in the field. Some students have been concerned that their colleagues following a more conventional program would complete their program sooner and be in position for

faster career advancement. The costs are higher because of the additional travel for the student and for the supervisors. Also, a student who must relocate once or twice during a study program may find this disruptive.

One of the first major experiences with this arrangement began in 1973 with an agreement between IDRC, Laval University, and the National Agricultural Research Station in Bambey, Senegal. Laval agreed to provide masters program training for 11 students from six Sahel countries, doing the course work at Laval and the thesis research at Bambey. According to the Laval, Bambey, and IDRC participants, the arrangement was an undoubted success. The director and staff of the Bambey station, where the research is being done and where several students will be employed, think that the arrangement is more appropriate than the conventional method.

Based upon this and other experience, the following model for a masters program illustrates this training system.

1. The student is identified by the home country and the sponsor as an outstanding candidate who holds a position currently or for whom a position has been identified. The program is costly; hence careful selection is extremely important.

2. The student is enrolled in the graduate program, and then the university, sponsor, home country or regional research unit, and the student agree on the program supervisor and the home country research supervisor. This is a critical step. The Canadian supervisor must have had enough experience with students from developing countries, and preferably with development projects, to be aware of the complexity of the supervisory role and sensitive to the problems facing the student. The system will work only when a competent scientist in the home country unit is available to supervise the research. It is important that the standard of training not be compromised in such an arrangement.

3. The student concentrates on course work during the first academic year. During this period a research topic is identified from a list of topics supplied by the home country research supervisor and, perhaps, from a list of topics appropriate to the home country supplied by the program supervisor.

4. The program supervisor may need to visit the home country to confirm the selection of the research supervisor if the personnel of the institution are not known to the Canadian university. The visit also will confirm the selection of the re-

search topic and agreement on the research plan. If the research must coincide with a particular season, the visit must be completed in time for the student to begin field work at the required time. Similarly, special equipment needs must be established sufficiently far in advance to have the equipment on site. This can be a problem, which could jeopardize the research plan and thereby unduly delay the completion date.

5. The student returns to Canada for the second academic year to complete course work and draft the thesis. The home country research supervisor should visit the Canadian university to review and reach agreement on the draft thesis. In conjunction with this visit the home country supervisor may wish to spend additional time in North America to improve his or her research capability. This exchange provides the opportunity for the establishment of a long-term association.

6. The student, upon completion of the thesis, returns to the home country to take up the career position identified at the outset.

A variation of this model, which would be appropriate in some situations, is for the student to be enrolled for the degree in a university in the home country or region, and to undertake the research and most of the course work in the home country, but to enrol in a Canadian university for certain courses not available in the home university.

The model described, or its variation, provides the most appropriate training in some situations but should not be substituted for the conventional arrangement in all cases. In certain subjects the student can work with materials and data from the home area by bringing them to the Canadian university and using the techniques or equipment available here. In other subjects it may be appropriate for the student to work continuously with the Canadian supervisor to acquire the necessary amount and type of expertise. The training model must be fitted to the needs of the student. Upon completion, it is important that the student's training be regarded of high quality by his or her colleagues, so that the student will be accepted into the scientific fraternity.

Neice and Braun, from a survey conducted in 1977, give an insight into some important aspects of foreign student study in Canada from the viewpoint of the students.[11] Their sample, which covered graduates, undergraduates, and other post-secondary students, was drawn from 27 institutions of post-secondary education, including 18 universities, two of which offered agriculture and one veterinary medicine.

Students from the least-developed countries felt they had made an excellent or good choice to study in Canada (90 per cent). Sixty-eight per cent planned to return home upon completion of their studies. The reasons given were: 48 per cent for family or personal preference; 34 per cent for obligations; 13 per cent for visa expiry; and 5 per cent for other reasons. Given the opportunity to stay in Canada upon completion of studies, 47 per cent would not want to stay, 40 per cent would stay temporarily, and 22 per cent would want to stay permanently. When asked which country they would like to settle in, 70 per cent indicated the home country, 14 per cent Canada, and 16 per cent another country.

The last set of data is important. Students from the least developed countries felt more strongly about returning home than other groups. Seventy per cent wanted to settle in the home country, compared to 59 per cent from countries farther along on the development scale and to 24 per cent of the students from Hong Kong. Although these data are not specific to food-system students, there is no reason to suspect a difference. If a difference does exist, it might favour the commitment to return to the home country or area because of the number of students on training arrangements where a position in the home country has already been identified.

Table II.10 – Source of Funding of Visa Students in Graduate Programs in the Food System at Canadian Universities

Source of Support	In-course Students 1978	First-year Award Holders 1972	1975	1976	1977	1978
CIDA bilateral	117*	21	30	21	70	26†
IDRC total	38	—	11	18	18	9
FAO	16	—	11	9	7	
Commonwealth scholarships	40					
Sub-total	208					
Other	69					
Total visa students	277					

*Estimate based on data supplied by CIDA. This excludes students funded in the project budgets.
†Total to October.
Source: Data supplied by Resources Division CIDA; Directors of divisions of IDRC and AUCC office.

Agencies currently sponsor more than 75 per cent of the graduate students from developing countries. (Table II.10.) The actual percentage is substantially higher because CIDA has no central records on the number of students studying the food system who are financed under its project budgets. Policy changes by the aid agencies will affect student numbers. The number of CIDA trainees at Cana-

dian universities in all CIDA programs has declined by as much as 50 per cent over the past five years, according to CIDA officials. However, the full CIDA picture is not known. Certainly, CIDA policy appears to be to provide training assistance in the home country or region if adequate facilities are available. In addition, the general scholarship plan has been phased out. However, training has been stressed in CIDA bilateral projects; consequently, a substantial number of students has been involved through the major institution-building projects managed by Canadian faculties and colleges of agriculture and veterinary medicine.

The main trend in the aid agencies is to reduce general scholarship support and focus training support more sharply by selecting the candidate to meet a specific need in the developing country, and by tailoring the program – especially the research component – to an identified need in the developing country. The effect of this trend is that the investment of effort and resources by universities in graduate student programs for developing countries becomes much more rewarding. Because policy changes by the aid agencies affect student numbers so significantly, it is essential that CIDA, IDRC, and the universities with food-system interests collectively plan the volume and kind of graduate programs needed for the future training of foreign students in Canadian universities.

Another trend is the increase in the number of students financed directly by their home governments. This is to be encouraged as a means of achieving self-reliance. However, the differential fee structure introduced by some provinces is an impediment. The home government, in directly financing the student, must pay the differential fee. For developing countries and certainly for those countries that Canada chooses to assist in development programs, it is unreasonable to require the differential fee. The problem has been solved for students supported by CIDA and IDRC, and there must be a way to extend this solution to cover students financed by the home country. The IDO should, with the support of CIDA and IDRC, explore the possibilities for removal of the burden of the differential fee.

Similarly, work permit restrictions on visa students create a serious problem in specialized fields where work experience is a necessary component of the training, for example, in certain programs in veterinary medicine.

Consideration might be given to the establishment of a masters program without a thesis requirement, especially designed with a development emphasis, as has been established in the United States. This might provide additional formal training for a wide group of professionals in government, extension, management, and other roles in developing countries. Such a program would offer opportunities to combine formal study with special project work related to the home country.

III. The Projects: Past Successes and Future Directions

Canadian universities have taken part in a wide range of project activities intended to help the developing countries strengthen their food system. This chapter includes an inventory of these projects, which was compiled to determine the extent and the nature of Canadian university participation during the 1968-78 period. Projects and related activities, and faculty person-year input, were classified as "professional advice" and "project implementation" as follows:

Professional Advice – At the request of the sponsor or executing agency, faculty members as consultants provide advice on a specific project or project area; for example, evaluation and planning of a proposed project, assessment of progress during the project period, post-project assessment, and general advice in a subject field. This may involve activities at the request of the sponsor or executing agency. Normally, these activities require from a few days to a few weeks.

Project Implementation – Faculty members participate directly in carrying out the project during the action stage; for example, directing or conducting the research, teaching and special services overseas, and research and special services in Canada.

This chapter provides an assessment of the success of projects, in both the professional advice and the project implementation categories and makes suggestions for improvements in the project system and for future concentration in the project activities.

Amount of Participation

The entire inventory of projects upon which the following data are based is shown in Appendix B. During the 1968-78 period, faculty members participated in 382 different activities related to 364 sepa-

rate projects. Before 1970, faculty participated, on average, in approximately 25 project activities annually. (Table III.1.) This number rose steadily after 1970, and by 1978 it had increased five-fold to 131 annually. The professional advice category, which contained nine in 1968, now contains 64 and the trend continues upward. In contrast, the project implementation category, which rose steadily until 1977, declined in 1978 due to the phasing out of the group of projects that had previously been funded by CIDA and managed by IDRC.

The number of faculty involved follows the same general trends described for projects numbers. (Table III.2.) One point of interest is the increase, which began in 1974, in the number of faculty taking part in projects other than those for CIDA and IDRC. This probably reflects the growing interest of faculty for participation in development activities at a time when opportunities to participate in the implementation of IDRC and CIDA projects were declining. Most of the projects in the "other" category are small, generally involving only one faculty member for a relatively short period.

Person-years reached a peak of 44 in 1975, and have since declined to 32 in 1978. (Table III.3.) Universities are now concerned with fewer large institution-building projects than they were in the middle of the decade. Also, CIDA terminated the unique arrangement for the participation of Canadian institutions in the research programs of the IARCs, and this substantially reduced the university contribution through CIDA and IDRC. In addition, the moderately large trypanosomiasis program of IDRC, involving Canadian universities, was terminated and no other large projects have been initiated in recent years.

Over the 11-year period, Canadian universities supplied a total of at least 314 person-years, or an average of 28 person-years annu-

Table III.1 – Number of Projects with Canadian University Faculty Participation, 1968-78

	Professional Advice				Project Implementation			
Year	CIDA	IDRC	Other	Total	CIDA	IDRC	Other	Total
1968	5	—	4	9	6	—	17	23
1969	2	—	3	5	5	—	11	16
1970	2	2	2	6	10	1	10	21
1971	4	6	3	13	11	3	10	24
1972	7	6	8	21	23	11	5	39
1973	3	5	11	19	24	13	8	45
1974	10	9	19	38	23	15	8	46
1975	15	9	19	43	26	17	12	55
1976	12	8	25	45	31	18	18	67
1977	11	12	27	50	32	14	26	72
1978	22	13	29	64	35	8	24	67

Source: Project Inventory and Assessment, Appendix A.

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Table III.2 – Number of Canadian University Faculty in Development Projects, 1968-78

Year	Professional Advice				Project Implementation			
	CIDA	IDRC	Other	Total	CIDA	IDRC	Other	Total
1968	5	—	4	9	8	—	5	22
1969	6	—	2	8	7	—	3	18
1970	5	3	1	9	14	—	3	26
1971	6	9	1	16	20	4	10	34
1972	9	8	3	20	30	13	4	47
1973	4	8	2	16	35	15	7	57
1974	14	11	14	39	40	24	1	65
1975	20	8	16	44	48	25	6	79
1976	11	8	16	35	55	27	8	90
1977	12	12	16	40	55	24	14	93
1978	30	13	20	63	55	11	20	86

Source: Project Inventory and Assessment, Appendix A.

ally, to the aid agencies and organizations to assist institutions in developing countries to strengthen their food systems. In 1978, 32 person-years were contributed, requiring the participation of approximately 125 faculty members.

Countries of Concentration

Most of the university activity has been related to the low- and middle-income, food-deficit countries, with about equal activity in each group. (Table III.4.) One-third of the person-years were provided to projects in sub-Sahara Africa, one of the critical regions in terms of food supply. The distribution of projects and person-years by individual country is shown in Table III.5.

Types of Projects

Forty-three per cent of the projects were directed toward increasing the capacity of institutions in the developing countries. (Table III.6.) Most of these institution-building projects were centred on universities, although some were related to national research centres and government units. There is, however, a major institution-building component in many other projects, especially those of IDRC, which are listed under other categories.

Production and rural development, using 35 per cent of the person-years, represented the second largest group of projects. The other four categories were much smaller in size and accounted in total for 22 per cent of the person-years. In the professional advice category the production and rural development group of projects was by far the largest, alone accounting for two-thirds of the person-years.

Table III.3 – Trends in Person-Year Input of Canadian University Faculty in Development Projects, 1968-78

Year	Professional Advice				Project Implementation				Total			
	CIDA	IDRC	Other	Total	CIDA	IDRC	Other	Total	CIDA	IDRC	Other	Total
1968	0.55	—	0.62	1.17	4.55	—	7.80	12.35	5.10	—	8.42	13.52
1969	0.47	—	0.27	0.74	6.05	—	6.32	12.37	6.52	—	6.59	13.11
1970	0.44	0.20	0.12	0.76	10.88	0.20	6.60	17.68	11.32	0.40	6.72	18.44
1971	0.45	0.93	0.32	1.70	14.10	0.35	2.65	17.10	14.55	1.28	2.97	18.50
1972	0.90	0.88	1.43	3.21	16.75	7.05	4.82	23.62	17.65	2.93	6.25	26.83
1973	0.48	1.14	1.98	3.60	19.03	3.05	4.17	26.25	19.51	4.19	6.15	29.85
1974	1.28	1.20	3.94	6.42	20.09	7.23	1.92	29.24	21.37	8.43	5.86	35.66
1975	3.60	0.96	3.89	8.45	21.62	9.71	3.85	35.18	25.22	10.67	7.74	43.63
1976	1.61	0.71	3.07	5.39	21.87	9.85	5.42	37.14	23.48	10.56	8.49	42.53
1977	1.01	1.68	4.67	7.36	19.42	5.75	6.40	31.57	20.43	7.43	11.07	38.93
1978	3.88	1.39	3.67	8.94	16.74	1.98	4.71	23.43	20.62	3.37	8.38	32.37
Total	14.67	9.09	23.98	47.74	171.10	40.17	54.66	265.93	185.77	49.26	78.64	313.67

Source: Project Inventory and Assessment, Appendix A.

Table III.4 – Summary of Faculty Project Activities, 1968-78

	Professional Advice		Project Implementation		Total Person-Years
	Projects	Person-Years	Projects	Person-Years	
Developing country group					
Food-deficit					
Low income	69	16.97	70	88.88	105.85
Middle income	67	16.20	67	110.72	126.92
High income	10	2.37	8	16.98	19.35
Grain exporters	5	0.83	7	16.51	17.34
Global and regional	44	11.37	35	32.84	44.21
Total	195	47.74	187	165.93	313.67
Regional group					
Asia	36	12.15	37	51.78	63.93
North Africa and Middle East	17	2.70	8	27.55	30.25
Sub-Sahara Africa	55	10.43	53	109.02	119.45
Latin America	65	14.87	74	53.62	68.49
Global and regional	22	7.59	15	23.96	31.55
Total	195	47.74	187	265.93	313.67

Source: Project Inventory and Assessment, Appendix A.

The Universities

Thirty-three Canadian universities had some project activity in the food system during the period. (Table III.7.) Although the eight universities with faculties or colleges of agriculture or veterinary medicine accounted for 78 per cent of the person-years, the input of other universities, at 22 per cent, was very significant, not only in fisheries but also in agricultural planning and production, rural development, and food and human nutrition.

The Sponsors

Aid agencies participated as sponsors of projects using slightly over 80 per cent of the person-years. (Table III.8.) CIDA and IDRC together accounted for 67 per cent; 53 and 14 per cent, respectively. CIDA actually accounts for more than that shown because several of the projects listed under the private and NGO sectors are fully or partially funded by CIDA.

Professional Advice

Faculty members participated as consultants in 195 project activities during the 11-year period, providing a total of 48 person-years of professional advice. (Table III.5.) The 1978 total was nine person-years. (Table III.4.) Although the professional advice category accounted for only 15 per cent of the total on project activities in the

Table III.5 – Summary of Faculty Project Activities by Region, 1968-78

Region	Professional Advice		Project Implementation		Total	Total
	Projects	Person-Years	Projects	Person-Years	Projects	Person-Years
Asia						
Bangladesh	4	0.85	1	0.10	5	0.95
Fiji	2	0.40	2	4.75	4	5.15
India	7	2.44	9	6.41	16	8.85
Indonesia	9	5.18	6	6.78	15	11.96
South Korea	1	0.13	0	0.00	1	0.13
Malaysia	4	1.77	5	16.23	9	18.00
Nepal	0	0.00	1	2.00	1	2.00
Pakistan	3	0.60	2	1.66	5	2.26
Philippines	2	0.25	2	0.65	4	0.90
Singapore	1	0.10	0	0.00	1	0.10
Sri Lanka	1	0.20	5	2.15	6	2.35
Thailand	2	0.23	3	10.95	5	11.18
Asia*	3	1.95	1	0.40	4	2.35
Sub-total	39	14.10	37	52.08	76	66.18
North Africa/Middle East						
Algeria	1	0.05	0	0.00	1	0.05
Iran	0	0.00	1	0.05	1	0.05
Iraq	1	0.10	0	0.00	1	0.10
Lebanon	1	0.02	0	0.00	1	0.02
Morocco	6	1.18	2	24.10	8	25.28
Saudi Arabia	1	0.17	1	0.30	2	0.47
Sudan	2	0.60	2	1.60	4	2.20
Tunisia	2	0.10	0	0.00	2	0.10
Turkey	1	0.08	2	1.50	3	1.58
Yemen PDR	1	0.10	0	0.00	1	0.10
Middle East*	1	0.30	0	0.00	1	0.30
Sub-total	17	2.70	8	27.55	25	30.25
Sub-Sahara Africa						
Burundi	2	0.35	0	0.00	2	0.35
Ethiopia	2	0.35	0	0.00	2	0.35
Ghana	4	0.60	6	41.73	10	42.33
Guinea	1	0.20	0	0.00	1	0.20
Kenya	7	0.72	20	40.27	27	40.99
Malawi	0	0.00	1	0.70	1	0.70
Mali	1	0.20	0	0.00	1	0.20
Niger	1	0.10	0	0.00	1	0.10
Nigeria	10	2.30	10	8.92	20	11.22
Rwanda	3	0.50	0	0.00	3	0.50
Senegal	2	0.13	2	0.40	4	0.53
Sierra Leone	1	0.10	0	0.00	1	0.10
Swaziland	1	0.80	1	0.60	2	1.40
Tanzania	3	0.85	4	3.95	7	4.80
Uganda	3	0.60	1	3.70	4	4.30
Upper Volta	1	0.10	1	0.10	2	0.20
Zaire	0	0.00	1	2.50	1	2.50
Zambia	4	0.70	2	2.25	6	2.95
West Africa*	5	1.35	2	2.40	7	3.75
Africa*	4	0.48	2	1.50	6	1.98
Sub-total	55	10.43	53	109.02	108	119.45

Latin America						
Argentina	0	0.00	1	2.00	1	2.00
Barbados	3	1.38	1	0.20	4	1.58
Belize	2	0.80	4	2.60	6	3.40
Brazil	8	1.88	11	11.28	19	13.16
Chile	1	0.05	1	0.20	2	0.25
Colombia	2	0.53	12	9.46	14	9.99
Costa Rica	1	0.03	0	0.00	1	0.03
Cuba	7	3.20	7	1.18	14	4.38
Dom. Republic	0	0.00	2	2.20	2	2.20
Ecuador	4	1.30	0	0.00	4	1.30
El Salvador	1	0.20	4	1.70	5	1.90
Guatemala	0	0.00	1	0.05	1	0.05
Guyana	2	0.06	1	2.50	3	2.56
Haiti	4	0.45	2	3.90	6	4.35
Honduras	1	0.20	0	0.00	1	0.20
Jamaica	1	0.10	4	1.18	5	1.28
Mexico	9	1.55	5	1.35	14	2.90
Nicaragua	0	0.00	1	0.10	1	0.10
Paraguay	1	0.10	1	0.25	2	0.35
Peru	3	0.72	4	4.05	7	4.77
Trinidad and Tobago	2	0.62	2	3.42	4	4.04
Venezuela	1	0.05	1	0.40	2	0.45
Caribbean*	8	1.13	7	5.10	15	6.23
Latin America*	4	0.52	3	3.00	7	3.52
Sub-total	65	14.87	75	56.12	140	70.99
Global†	19	5.64	14	21.16	33	26.80
Total	**195**	**47.74**	**187**	**265.93**	**382**	**313.67**

*Listing reported by respondents to questionnaire.
†Projects involving two or more regions.
Source: Project Inventory and Assessment, Appendix A.

inventory, the potential impact of Canadian technical assistance in the food system is very great. Faculty members participate in project feasibility and design studies, in progress assessments, and in project reviews. They sit on advisory committees that monitor major projects, and they provide the expert advice needed at various stages in project delivery. Most of the activities are short-term individual consultancies, usually of one to three weeks, although some necessitate advice at intervals over several years. Some, such as certain project feasibility studies, require a team. These activities are critical to the project system, but the visibility of the university is usually low because the contribution is not directly concerned with the implementation stage of the project.

The IDRC post-production research program, which deals with the sector of the food system from harvesting to family diets, has drawn heavily on Canadian universities and is one effective model for involvement. The IDRC associate director responsible for post-pro-

Table III.6 - Distribution of Person-Years by Topic Central to the Project, 1968-78

	Professional Advice				Project Implementation				Total			
	[illegible]	[illegible]	Other	Total	[illegible]	[illegible]	Other	Total	[illegible]	[illegible]	Other	Total
Production and rural development												
Agriculture	7.82	4.55	13.98	26.35	34.64	26.92	24.03	85.49	42.46	31.37	38.01	111.84
Fisheries	1.65	0.98	3.61	6.24	1.20	2.05	2.50	5.75	2.85	3.03	6.11	11.99
Terrestrial Wildlife	–	–	0.25	0.25	–	3.00	0.20	3.20	–	3.00	0.45	3.45
Sub-total	9.47	5.53	17.84	32.84	35.84	31.97	26.73	94.44	45.31	37.40	44.57	127.28
Food and human nutrition	0.01	2.04	1.24	3.29	1.00	7.80	2.38	11.18	1.01	9.84	3.62	14.47
Social, economic, and environmental factors												
Economics and planning	0.45	—	—	0.45	7.90	—	—	7.90	8.35	—	—	8.35
Environmental impact	—	—	0.60	0.60	0.10	—	1.00	1.10	0.10	—	1.60	1.70
Social and cultural factors	—	—	0.40	0.40	—	—	6.76	6.76	—	—	7.16	7.16
Sub-total	0.45	—	1.00	1.45	8.00	—	7.76	15.76	8.45	—	8.76	17.21
Institution-building												
Agriculture and food	2.91	0.02	0.27	3.20	101.91	0.34	6.20	105.41	104.82	0.32	6.47	111.61
Fisheries	0.40	—	—	0.40	6.95	—	—	6.95	7.35	—	—	7.35
Sub-total	3.31	0.02	0.27	3.60	108.86	0.30	6.20	115.36	112.17	0.32	6.47	118.96
Short courses, workshops, university instruction, educational planning	0.50	0.20	2.38	3.08	7.40	—	7.69	15.09	7.90	0.20	10.07	18.17
Special committees and activities	0.93	1.50	1.25	3.68	10.00	0.20	3.90	14.10	10.93	1.50	5.15	17.58
Total	14.67	9.09	23.98	47.74	171.10	40.17	54.66	265.93	185.77	49.26	78.64	313.67

Source: Project Inventory and Assessment, Appendix A.

Table III.7 – University Participation in Food-System Development Projects, 1968-78

University	Professional Advice		Project Implementation		Total	Total
	Projects	Person-Years	Projects	Person-Years	Projects	Person-Years
Alberta	27	6.03	17	17.57	44	23.60
British Columbia	12	6.09	15	8.57	27	14.66
Brock	—	—	1	0.50	1	0.50
Calgary	5	1.13	4	1.40	9	2.53
College of Cape Breton	—	—	1	0.12	1	0.12
Carleton	—	—	3	2.30	3	2.30
Concordia	—	—	1	2.50	1	2.50
Dalhousie	5	3.50	5	2.81	10	6.31
Guelph	46	7.68	43	77.51	89	85.19
Laurentian	2	0.65	2	1.90	4	2.55
Laval	11	1.90	5	27.45	16	29.35
Lethbridge	—	—	1	1.00	1	1.00
Manitoba	25	3.02	20	36.12	43	39.14
McGill	22	4.58	14	23.83	36	28.41
McMaster	3	0.82	3	0.30	6	1.12
Memorial	1	0.20	—	—	1	0.20
Montréal	3	1.10	—	—	3	1.10
Mount Allison	—	—	1	1.20	1	1.20
Mount St. Vincent	—	—	1	1.00	1	1.00
Nova Scotia Agric College	—	—	2	1.80	2	1.80
Quebec	2	0.20	1	2.25	3	2.45
Queens	1	0.40	4	3.60	5	4.00
St. Mary's	—	—	1	2.00	1	2.00
Saskatchewan	15	4.25	16	22.50	32	26.75
Simon Fraser	3	0.23	4	2.35	7	2.58
Toronto	8	1.04	—	—	8	1.04
Victoria	—	—	1	3.40	1	3.40
Waterloo	3	2.00	13	3.11	16	5.11
Western	1	0.40	—	—	1	0.40
Wilfrid Laurier	—	—	4	1.25	4	1.25
Windsor	—	—	1	0.41	1	0.41
Winnipeg	1	0.20	—	—	1	0.20
York	9	1.70	18	19.20	27	20.90

Source: Project Inventory and Assessment, Appendix A.

duction research together with the program officers, are located at the University of Alberta. Their interaction with Alberta faculty members resulted in a partnership in which faculty members participated in the program on a relatively continuous basis by providing professional advice. In Nigeria, faculty provided support in engineering, economics, and management organization for the very successful IDRC Maiduguri Mill project (Figure III.1), and they recently completed a study at the request of the Nigerian government on the feasibility of additional mills in other areas of the country. Other universities that carried out supporting research projects critical to the mill project are also indicated in Figure III.1. The universities, using special facilities and expertise available in Canada but not in Nigeria, were able to contribute in a unique way to the development of milling equipment, baking methods, and new food products.

Table III.8 – Sponsors of Projects Involving Canadian University Faculty, 1968-78

Sponsor	Professional Advice		Project Implementation		Total	Total
	Projects	Person-Years	Projects	Person-Years	Projects	Person-Years
Aid Agencies						
CIDA	65	14.67	74	171.10	139	185.77
IDRC	44	9.09	32	40.17	76	49.26
FAO	9	1.48	8	8.15	17	9.63
UNDP	2	0.20	5	4.45	7	4.65
UNESCO	1	0.25	7	3.97	8	4.22
WHO	3	0.39	2	1.20	5	1.59
Ford	5	3.35	8	11.60	13	14.95
Rockefeller	1	0.05	0	0.00	1	0.05
World Bank	6	1.90	2	2.90	8	4.80
CGIAR	1	1.05	3	2.50	4	3.55
ODM	0	0.00	6	4.60	6	4.60
USAID	2	0.23	1	1.50	3	1.73
SIDA	1	0.20	0	0.00	1	0.20
GTZ	0	0.00	1	0.12	1	0.12
DANIDA	0	0.00	1	1.40	1	1.40
Sub-total	140	32.86	150	253.66	290	286.52
Canadian Government Departments						
External Affairs	1	0.30	1	0.10	2	0.40
Industry, Trade and Commerce	1	0.10	1	0.10	2	0.20
Canada Comm. Remote Sensing	1	0.32	1	0.10	2	0.42
Alberta government	1	0.40	0	0.00	1	0.40
Sub-total	4	1.12	3	0.30	7	1.42
Canadian Granting Councils						
SSHRC	0	0.00	5	3.60	5	3.60
NSERC	0	0.00	5	1.30	5	1.30
Sub-total	0	0.00	10	4.90	10	4.90
Foundations						
Commonwealth	2	0.17	1	0.12	3	0.29
Donner Canadian	1	2.00	0	0.00	1	2.00
World Wildlife	0	0.00	1	0.50	1	0.50
Sub-total	3	2.17	2	0.62	5	2.79
Canadian Universities	4	1.10	9	4.31	13	5.41
Non-governmental Organizations						
CUSO	5	3.59	5	2.08	10	5.67
CESO	1	0.06	1	2.20	2	2.26
Rotary Club	1	0.10	1	0.20	2	0.30
Mennonite Central Comm.	2	0.20	1	0.50	3	0.70
CBI	1	0.20	0	0.00	1	0.20
United Church of Canada	0	0.00	1	2.00	1	2.00
CanSave	2	0.60	1	0.66	3	1.26
Sub-total	12	4.75	10	7.64	22	12.39
Canadian Associations						
Canada Grains Council	2	0.23	1	0.10	3	0.33

Rapeseed Assoc. of Canada	1	0.06	0	0.00	1	0.06
Canadian Wheat Board	0	0.00	1	0.10	1	0.10
Holstein-Friesian Assoc.	0	0.00	1	0.10	1	0.10
Sub-total	3	0.29	3	0.30	6	0.59
Private Firms	16	4.03	5	4.44	21	8.47
Developing Countries	10	2.20	5	2.30	15	4.50
Other						
OAS	0	0.00	1	0.05	1	0.05
IAEA	2	0.28	9	3.48	11	3.76
UN University	1	0.09	0	0.00	1	0.09
National Geographic	1	0.30	0	0.00	1	0.30
National Science Fdn.	0	0.00	1	0.15	1	0.15
PAIGH	0	0.00	1	0.10	1	0.10
ICU	0	0.00	1	0.15	1	0.15
OECD	0	0.00	1	1.00	1	1.00
Sub-total	4	0.67	14	4.93	18	5.60
Not Classified	16	3.64	17	12.25	33	15.89

Source: Project Inventory and Assessment, Appendix A.

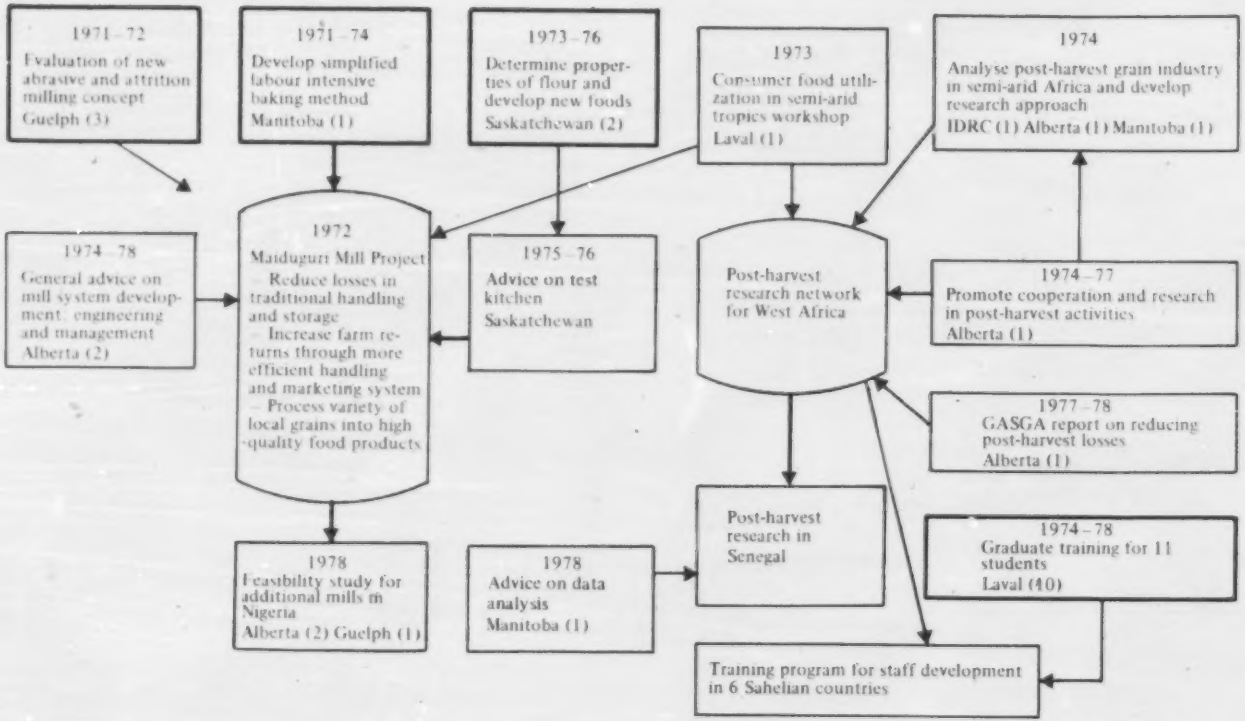
Working with IDRC staff, the Alberta faculty made similar key contributions to the process of evolving a network approach for post-harvest research in West Africa. Laval and Manitoba faculty have also contributed in staff training at the graduate level – with thesis research in Senegal – and in expert advice for one section of the research program. In total, five universities and 24 faculty members have played some role in the post-production programs in West Africa.

The Alberta faculty, working as a team with IDRC staff located in Alberta, has had a major impact in Africa and in Southeast Asia on the development of post-harvest research programs using the systems approach. They have had this impact because of the opportunity provided by a partnership to work on a series of short-term assignments within a reasonably long-term timeframe. They currently have an input into the 60 active IDRC projects in post-harvest research. In Alberta, Canada now has a centre of strength in post-harvest research related to development, resulting from participation in IDRC programs. With careful planning it should be possible to develop more such partnerships and centres of strength.

One of the most satisfying features of university partnership in IDRC post-harvest production research is the knowledge that the universities are participating in a grassroots program. Consumer preference surveys have been conducted, local research stations and government extension agents are involved, and farmers at the village level are identifying needs and helping refine and test new technologies.

Both CIDA and IDRC generally appear to be satisfied with the

Figure III.1 – Canadian Participation in IDRC Post-Harvest Research and Development in West Africa


1971–72
Evaluation of new abrasive and attrition milling concept
Guelph (3)
1971–74
Develop simplified labour intensive baking method
Manitoba (1)
1973–76
Determine properties of flour and develop new foods
Saskatchewan (2)
1973
Consumer food utilization in semi-arid tropics workshop
Laval (1)
1974
Analyse post-harvest grain industry in semi-arid Africa and develop research approach
IDRC (1) Alberta (1) Manitoba (1)
1974–78
General advice on mill system development, engineering and management
Alberta (2)
1972
Maiduguri Mill Project
– Reduce losses in traditional handling and storage
– Increase farm returns through more efficient handling and marketing system
– Process variety of local grains into high quality food products
1975–76
Advice on test kitchen
Saskatchewan
Post-harvest research network for West Africa
1974–77
Promote cooperation and research in post-harvest activities
Alberta (1)
1977–78
GASGA report on reducing post-harvest losses
Alberta (1)
1978
Feasibility study for additional mills in Nigeria
Alberta (2) Guelph (1)
1978
Advice on data analysis
Manitoba (1)
Post-harvest research in Senegal
1974–78
Graduate training for 11 students
Laval (40)
Training program for staff development in 6 Sahelian countries

Note – Boxes with heavy lines indicate project implementation, others indicate professional advice.
– Figures in parentheses refer to the number of faculty members.

quality of the work carried out by faculty members in the provision of advice. CIDA estimates an increasing requirement for such assistance, and the Agriculture, Food and Nutritional Sciences Division of IDRC projects that the amount will remain about the same or increase slightly. In 1978 a FAO committee, studying the role of experts, found that most developing countries see a growing need for short-term consultancies and a declining need for resident experts (Table III.9), and concluded that this trend would continue in the future.[1]

The provision of professional advice can increase. Approximately half of the Canadian university faculty members responding to the questionnaire indicated that they would like more professional advice assignments. Further, this kind of activity, because of the short periods of time involved, is fairly easily accommodated in conjunction with other university activities. The potential contributions from this kind of work, the increasing need, the availability of faculty, and the relative ease of integrating it with other university activities make it apparent that professional advice is one of the important contributions that universities can make in the future.

Table III.9 – Views of Developing Countries on Change in Relevance of Five Assistance Categories, 1968-78

Component	Compared with ten years ago the need is now							
	More		Same		Less		Total	
	No.	%	No.	%	No.	%	No.	%
Resident foreign experts	26	37.1	16	22.9	28	40.0	70	100
Short-term foreign consultants	52	73.2	13	18.3	6	8.5	71	100
Cooperation with foreign institutions	52	74.3	16	22.9	2	2.8	70	100
Training abroad of project personnel	49	69.0	18	25.4	4	5.6	71	100
Equipment from abroad	49	69.0	15	21.1	7	9.9	71	100

Source: FAO, *The Role of Experts in Development Cooperation*, Report to the Seventy-Fourth Session of the Council of FAO, November-December 1978.

Project Implementation

Faculty members took part in the implementation phase of 187 projects. (Table III.5.) This amounted to 266 person-years, an average of 24 supplied annually by the universities. The 1978 level was 23 person-years. (Table III.4.)

Projects in which Canadian universities participated in the implementation stage were grouped under categories corresponding to the unit in the developing country that cooperated with the Canadian university in carrying out the project. (Table III.10.) The main categories are discussed below.

Table III.10 – Summary of University Project Activities According to the Cooperating Unit in the Developing Country, 1968-78

Cooperating Unit	Professional Advice		Project Operations		Total
	Projects	Person-Years	Projects	Person-Years	Person-Years
University	32	9.14	50	136.01	145.15
Other educational institution	1	0.35	2	1.20	1.55
National research unit	17	3.30	15	12.60	15.90
International or regional research unit	25	6.23	31	42.38	48.61
Government non-research unit	71	17.98	59	59.65	77.63
NGO	2	0.20	1	0.10	0.30
Private firm	8	1.33	0	0.00	1.33
Not specified	39	9.21	29	13.99	23.20
Total	195	47.74	187	265.93	313.67

Source: Project Inventory and Assessment, Appendix A.

University Projects

Projects in which Canadian universities have cooperated with universities in the developing countries are of three main types:

1) an individual faculty member is released from the Canadian university to meet a request from a university in a developing country through an aid agency;
2) comprehensive projects aimed at generally strengthening a university in a developing country, including a staffing component, a staff training component, assistance in improving equipment and facilities, and assistance in program development;
3) projects similar to those in 2) but limited to a specific objective, such as assistance in establishing a graduate program in a particular subject.

In the first type, the role of the Canadian university is to grant the faculty member leave to assist the university in the developing country; arrangements are made by the aid agency. He or she becomes an expatriate member of the university faculty for the contract period, and usually provides teaching services. Although the contribution of the faculty member under such arrangements has been significant in the short term, the longer term impact on strengthening the university has been modest at best, and often minimal. Limited Canadian resources should not normally be used for the sole purpose of filling a teaching position.

The second type of project, which is intended to strengthen the university on a broad front, invariably gives a greater opportunity to faculty participants to affect the long-term development of the

university. The level of success in these projects has varied from extremely low to excellent, depending primarily on the quality of the planning and management. In both agriculture and fisheries the most successful projects have been those managed by a Canadian university; the least successful have been those for which CIDA recruited individuals from different universities or government units in Canada and managed the project directly. Generally, the CIDA food-system projects that were managed by Canadian universities have been successful, in terms of the degree by which the university in the developing country had been strengthened at the end of a contract, or subsequently.

The earliest such project was the Khon Kaen-Manitoba project initiated in 1965. Thailand established Khon Kaen University in north-east Thailand in 1964 as part of a national plan for the development of the northeastern region. The University of Manitoba, as the executing agency* under contract with CIDA, assisted in the development of the faculties of agriculture and engineering. Seven members of the Manitoba Faculty of Agriculture were at Khon Kaen University during the contract period from 1965 to 1974. The number of agricultural graduates from Khon Kaen has grown from 35 in the first graduating class in 1967-68 to 120 in 1977-78. The number of faculty members in departments of the Faculty of Agriculture holding graduate degrees grew from zero in 1965 to 55 out of 94 in 1978, 11 of the 55 holding graduate degrees from Canada, and 19 on leave from graduate training at present. The agricultural engineering department, established in the Faculty of Engineering during the project, is developing well and 6 of its 12 faculty members have MSc degrees from Canada. Research is underway and there is some, although probably not enough, outreach work. Relations were good between the Canadian team and their Thai colleagues. The project must be judged a success.

Khon Kaen University was at an early stage of development when the Canadian project began but it was built on the solid foundation of successful university operation in Thailand. In addition, a reasonable level of local funding was available to establish the university and to continue its development. The situation was very different in the Faculty of Agriculture and Veterinary Medicine (FAMV)-Laval project, in which the Faculty of Agriculture of Laval is the executing agency for a CIDA contract to assist in the development of this faculty at the University of Haiti. Although a long-established Haitian faculty, its budget has been low and its physical facilities, library, equipment, and faculty resources seriously limited. By January 1979, at the end of 18 months of project activity under

*As executing agency, the university is responsible for the management of the project usually under a contractual arrangement with the aid agency.

strong team leadership on site, the accomplishments are impressive: the curriculum had been fully revised; rigorous entrance standards were established and implemented; a faculty council and departmental structure were established; teaching and research laboratory facilities had been planned; research station facilities had been arranged; and five candidates had been identified for graduate training to strengthen the faculty.

The largest and most comprehensive university-building project in the food-system field, with a Canadian university as the executing agency for a CIDA contract, was the Ghana-Guelph project, 1970-1978. This project was a cooperative arrangement through CIDA, designed to assist the University of Ghana in reaching its institutional goals through a mutually beneficial arrangement with the University of Guelph.[2] The broad scope of the project is indicated by the variety and number of its participants.

Nineteen academic departments took part in the project:

University of Ghana	5
University of Guelph	11
University of British Columbia	2
University of Manitoba	1

The number of Canadian academic staff, who were in Ghana during the project, was 23, representing a commitment of 47 person-years. Four Ghanaian faculty held research fellowships at Guelph. The 41 Ghanaian students assisted under the program comprised 29 graduates, three undergraduates, and nine in non-degree courses. The subsequent location of these 41 students was as follows:

University of Ghana (faculty)	27
University of Science and Technology, Ghana (faculty)	2
Ministry of Agriculture, Ghana	7
Ministry of Education, Ghana	1
In-course students	2
Remained in Canada and unknown	2

In addition, seven Canadian graduate students studied at the University of Ghana. In total, there were 120 direct participants in the Ghana-Guelph project.

The project is considered a success by the University of Ghana, by Canadian faculty participants, and by CIDA staff. The university has grown in strength to the point that this location is increasingly selected by CIDA scholars from developing countries on third-country training arrangements. In addition to the staff development component, the project supplied research equipment and support for library holdings. Canadian faculty members in Ghana, using these resources and some project research funds, were able to produce a significant amount of research. They worked with Ghanaian faculty colleagues and with the Ghanaian and Canadian graduate students

who were doing their thesis research on Ghanaian topics. This resulted in 128 theses and scientific publications and 53 papers presented at scientific and professional meetings. Canadian faculty also participated in outreach programs.

Of special interest in this project was an in-service training program for technical officers of the Ghanaian Ministry of Agriculture. Guelph project staff, in cooperation with Ghanaian faculty and ministry staff, assisted in training more than 1400 technical officers in extension methods in 58 short courses. The Ministry requested and CIDA approved continuation of Canadian assistance for this outreach phase through 1979. The Ghanaian request for renewal is one measure of the success of the outreach phase, an activity that should be an important component of the program of all universities in developing countries that have faculties dealing with the food system. It is also significant that the two universities have recently signed an agreement on long-term cooperation.

Two new CIDA projects of this type are just being implemented: a cooperative arrangement between the University of Zambia and the University of Manitoba in agriculture, with Manitoba as the executing agency for CIDA, and a CIDA-managed project to strengthen the academic and research program in fisheries at the University of Creara in Brazil.

The number of projects of the third type, also university-building but with a more specialized focus, has increased in recent years, and there seems to be a growing demand. In one such project the University of Saskatchewan, as the executing agency for CIDA, is cooperating with the Federal University of Pernambuco and the Federal Rural University of Pernambuco in Brazil in the development of graduate and research programs in soil science. Seven faculty members of the Brazilian universities will undertake graduate studies at Saskatchewan, and do their thesis research in Brazil. Seven Saskatchewan faculty members will spend short periods in Brazil to assist in specialized activities in soil science; one Canadian faculty member, full time in Brazil, is the resident project coordinator.

In a similar project, the University of Guelph, as the executing agency for CIDA, has a cooperative arrangement with the University of Campinas in Brazil under which Canadian academics will visit for periods of a few months each to assist in specific aspects of the development of a graduate program in food science and food engineering. Specialized equipment is being supplied as well. A third CIDA project of this type has just reached the implementation stage. In this, the University of the West Indies in Trinidad (UWI) and the University of Guelph are cooperating in the development of an agricultural engineering undergraduate program. Several UWI faculty will each spend three to four months at Guelph working with

Guelph faculty to develop the specific background needed for the program. In addition, three technicians will work at Guelph to develop special skills, and several Guelph faculty will take part individually in two or three short-term specialist assignments at UWI, as needed, to support the UWI program during its development stage. The University of Guelph is not the executing agency. A private consulting firm has been assigned general management for this project and for a companion project at UWI that involves Nova Scotia Technical College. The success of this management model has yet to be determined.

The UWI-McGill Canefeed Project is another example of a specialized type of project. It comprises a demonstration and training centre to develop the use of sugar cane as livestock feed in the Caribbean, a concept that could be of major significance for the livestock industry in the region. Under McGill management, and with UWI and Trinidad and Tobago government cooperation, it is well established. The second phase, which will transfer management to the UWI, is critical and has yet to take place. Successful operation by UWI, in a cooperative arrangement with McGill for the transfer period, would provide UWI with a major demonstration and outreach program, of great importance for a university in a developing country.

There appears to be no single set of procedures that, if used, will guarantee success in these institution-building projects; there are many variables. However, a number of elements critical to success have been identified by Shute[3] and by others interviewed in the course of this study.

1. University Commitment – Development projects are inherently complex and difficult to manage. Universities should undertake development projects only if they are prepared to provide the management and support to faculty members involved in the implementation of the project.

2. Partnership – The essence of the arrangement must be a partnership in which both universities take full part. Accomplishing this in practice is not easy, and elements must be built into the arrangement to create and encourage mutual benefit.

3. Clear Objectives and Responsibilities – It is vital that the agreement clearly sets out realistic project objectives and clearly states the role and responsibilities of each university and CIDA.

4. Project Administration by the University – University management of some CIDA projects has been weak in the past. Weaknesses that have appeared include recruitment of unsuitable people, inadequate time spent by the university-based manager in support

of the field staff, non-adherence to the schedule, and inadequate budget planning and control. In general, these problems have not been serious in food-system projects but they have existed. Unfortunately, in other sectors there are examples of projects that have failed because of such problems or whose success has been severely limited. Past experience affects the thinking of CIDA personnel when they consider new projects with the universities as the executing agencies. Quite reasonably, CIDA expects that a university, in undertaking a project as the executing agency, will make adequate administrative arrangements to meet the contractual requirements.

The university must appoint a project manager. It is crucial that this person be relieved of other university duties so that adequate time is available for the project. Also it is preferable that the person be available for the full project period. The project manager should be experienced in international activities or, if not, be given a careful and comprehensive orientation. Above all, the project manager must be committed to development activities, enthusiastic about the project, sensitive to the problems facing both the host university and the Canadian participants, and should understand the food system. Adequate accounting and other services must be made available to the manager.

In large or complex projects a team leader for the Canadian university is needed to work in the field with the project director at the host institution. This person should be experienced in development projects, or if not, should be given substantial time for orientation before the project starts. Ideally, the person should be available for the life of the project; if this is not possible, the first team leader should be available for several years at least. In cases where there is a heavy administrative burden such as for procurement, and where adequate support services are not available in the host university, the team leader will need administrative assistance in the field. This has been a problem in some projects.

5. CIDA Project Administration – Universities have had many difficulties in working with CIDA on institution-building projects. Project staff, not familiar with the complexity of the food system, the rapid turn-over of project officers, and the general organization of CIDA's field supervision seem to be the main causes of the multiplicity of problems encountered.

6. Faculty Participants – Careful selection of the Canadian professionals is critical to project success. They must be competent, fully briefed, committed to the partnership approach, and aware of the need to use Canadian knowledge not for direct transfer but rather as background for the development of a university program suited to the needs and wishes of the host institution and region.

Special arrangements are needed to ensure minimum disruption of the academic careers of participants in the general institution-building projects, otherwise it will be difficult to recruit faculty of high quality. This requires provision in the contract for the faculty member to continue a satisfactory amount of research in the home or host institution. Some faculty who have been on two-year assignments remarked in interviews that this was an important problem. Many who excelled during one term in the field felt that unless special arrangements were made they would not consider a term longer than two years or consider participating in a second project because of the possible effect on research in the discipline specialty, and therefore on their careers. Special arrangements will vary but will often mean provision of a research associate at the home university, or technical assistance to maintain a basic research program in Canada, together with some research in the host university and the opportunity to attend one scientific conference each year. In addition, when faculty return from an assignment of two years or more, they should have a period of reduced teaching for six months in order to bring their professional knowledge up to date and to develop their research program, before being required to take on a full teaching load.

Faculty members feel a two-year period is reasonable for field participation in the general institution-building projects. It is an acceptable compromise between the efficiency of faculty resource use in the project and the ability to attract the most qualified people to the project. In the second generation of institution-building projects, specialists are needed for short periods only and the problem of a lengthy period of service does not arise.

7. Reward Structure – Special precautions are required to assure faculty that development project activities will be fully considered in salary, promotion, and tenure review. For faculty serving in the field this is especially important.

8. Length of Project Period – Institution-building projects of the type that include a graduate training program for staff are long-term, requiring at least seven years. Such projects must allow sufficient time for the last student selected for training to complete the program and return to the staff before the project team leaves. Too often contracts have been written for unrealistically short periods.

9. Continuing Association – In the past a project was deemed complete at the end of the contract period and no provision was made for a follow-up association. When the project is over, the host faculty, who were on training programs, return to the university, and the equipment and facilities provided under the project are

made available to them. This is a critical point for realizing the benefits of the investment in the project; yet this is the time when the association is usually terminated.

It would be wrong for the Canadian involvement to continue in a manner that would interfere with the development of self-reliance. Certainly a continuing association for the subsequent period, during which the host university unit should become self-sustaining, must be of a different nature from that of the project itself. The form would vary but might include short visits of faculty in both directions to continue collaboration in research, the provision of specialized information and short courses, special leave programs for professional development in specific fields, and continued exchange of graduate students.

In addition, it is important in the post-project stage for faculty members who have just completed degrees to have research resources enabling them to undertake critical development-oriented research. It would be appropriate for CIDA and/or IDRC to support a follow-up stage in institution-building projects to assist trained faculty in establishing a research or outreach program. Research activities could be carried out in collaboration with IDRC, which would manage the research for CIDA as was done in the cassava and triticale programs. Such research would be identified by IDRC, working with the individual faculty members in establishing a research direction compatible with development needs of the country and with IDRC programs. This arrangement would provide a mechanism for the second stage of institution-building and encourage highly qualified, recently trained faculty members to initiate quickly those research programs needed for food-system development in their country. It is encouraging to note that IDRC has funded two research projects in the Faculty of Agriculture of Khon Kaen University, following the conclusion of the Khon Kaen-Manitoba project.

International, Regional, and National Research Unit Projects

The IARCs comprise a network of research centres and programs established to increase food production in the developing world through research programs and the training of production specialists.[4] This was an innovative response to the need to deal with the food problem and is one of the most powerful of the institutional structures in place for attacking the food problem on a world scale. Canada provides unrestricted core support for the IARCs through the Multilateral Branch of CIDA. Additional support is provided by IDRC for specific projects. This support is a very important element in Canada's technical assistance program.

Under the current arrangements, no provision is made by either CIDA or IDRC for continuing university participation in the programs of the Centres. This is puzzling in the light of the views ex-

pressed by one Centre director during an interview for this study. He indicated that the universities were important to the Centres for three main types of support. First, the Centre requires basic research on the specific problems it encounters in its mission-oriented programs. Universities, with their range of specialties and special equipment, could assist in this. Second, basic research is needed that will lead to the development of important new ideas, which the applied programs of the Centres could expand and develop. The IDRC-University of Saskatchewan project to expand basic knowledge on drought resistance is an example. Such research is important in the establishment of a basis for the next generation of technology. Third, the Centres and universities could collaborate on graduate training in situations in which the thesis research of students from developing countries or Canada should be done in the developing country.

An imaginative model was developed by CIDA for the participation of the universities in Centre programs between 1970 and 1975. In addition to providing core support to the International Centre for Tropical Agriculture (CIAT) in Colombia, CIDA earmarked a block of funds for research by Canadian institutions on selected aspects of the CIAT cassava program. Cassava is a major food crop in the low-income, food-deficit areas of the tropics. The earmarked CIDA funds were managed by IDRC, which established a committee to advise on the cassava program centred at CIAT. Two Canadian university professors were members of the advisory committee; thus, a partnership was established. Canadian universities undertook the special research needed for those parts of the program that CIAT did not have the expertise or special equipment to undertake.

During the five-year period, the program involved two universities, 12 academic departments, and 15 faculty members, together with research associates and graduate students. The National Research Council laboratory in Saskatchewan also took part.

The research was of high quality and successful in the view of IDRC. Following the termination of the CIDA arrangement in 1975, two aspects were continued as IDRC projects in order to capitalize on the investment. CIAT benefitted in obtaining the research it needed but could not perform; the universities benefitted by increasing their capability to provide relevant graduate research training to students from developing countries who had an interest in tropical agriculture. They also benefitted from the increase in the number of faculty members with experience in development research and tropical agriculture.

One outcome of the research investment was the development, at no further cost to CIDA or IDRC, of an enhanced capability for the appropriate training of students from developing countries and the establishment of a centre of strength for graduate training, with

cassava as the research topic. IDRC subsequently capitalized on this new Canadian capability in its program to develop a world network for cassava research. Another outcome of direct benefit to Canada is that the biomass harvester, developed for cassava, now shows promise for use in Canadian industry.

The other half of this imaginative CIDA-IDRC arrangement was a program in triticale, operated in the same manner as the cassava program. Before the start of this program, triticale had been developed by the University of Manitoba to the point where it showed promise as a new cereal for cool environments in developing countries. The International Maize and Wheat Improvement Centre (CIMMYT) in Mexico began a major program to develop varieties and germ plasm and to explore the potential of triticale as a new crop for developing countries.

The CIDA-IDRC program at Canadian universities was designed as an integral part of the CIMMYT program. Manitoba undertook basic studies on spring triticale to provide new information and germ plasm to the applied research and development program at CIMMYT headquarters. CIMMYT recognized a potential for winter triticale for high-elevation areas in some developing countries, but did not have the environmental conditions in Mexico to conduct winter triticale research. Guelph, which had the appropriate environment and experience in winter cereal research, was asked to evaluate CIMMYT winter triticale germ plasm, and to develop new germ plasm supply for both the CIMMYT breeding program in Mexico and individual countries for a final evaluation, and possible development of new varieties.

The type of research carried out at the two universities utilized unique expertise, experience, and special environmental conditions. It was supporting research planned and conducted as an integral part of the international program and was successful; and yet CIDA terminated the arrangement. Subsequently, IDRC arranged to fund part of the Canadian program, enabling it to continue for a specified period in order to capitalize on the original work and provide time to explore other possible applications. An interesting and important outcome of this work is that the performance of the new genetic materials from the Guelph international triticale program indicates that winter triticale has potential as a new crop in Canada.

The reasons for CIDA's termination of the cassava and triticale programs were not made clear to the universities. The assumption is that CIDA, although providing core support to the IARCs for research, decided that research support to the same Centres through its Bilateral Branch was outside its mandate. This is an acceptable position if, indeed, another Canadian funding source has the mandate, the policy, and the funds to conduct such research. IDRC has the mandate.

Universities have participated in a number of projects where the cooperating unit was a national research unit. In the case of the Njoro research station project in Kenya, which ran for five years commencing in 1970, the University of Manitoba was the executing agency for CIDA. However, in most such projects university participation took the form of a specific task in a project for which the university was not the executing agency. One example is the recently completed two-year study for Peru to develop a basis for the management of the Peruvian anchovy fishery. Two universities, in conjunction with Environment Canada, participated in the research, which took place aboard a Canadian research vessel.

Government Projects

University faculty have participated in a large number of projects in which the cooperating unit in the developing country was a government department or agency. In most cases an individual faculty member has participated in a program where the executing agency was not the Canadian university. Again, there are exceptions such as the Swaziland Dairy Development Project with the University of Saskatchewan as the executing agency, and the Planning Unit for the Nigerian government with York University as the executing agency.

Universities can play an important role in these projects by providing professional advice. They should, however, generally assign a low priority to participation in the implementation phase, especially as executing agency, of projects that are primarily concerned with the organization and management required to deliver government services, or to compile resource inventories. They should also assign low priority to production projects, such as the Tanzanian wheat project, and to the management of large rural development projects such as the DRIPP project in Haiti. This suggestion does not imply that such projects are low in priority because they are not critical to development, but is offered because universities with very limited resources should concentrate on activities in which they can make a unique contribution. Universities are not uniquely skilled in the management of these types of projects; private firms and Canadian government units are the logical choices as executing agencies in most cases. University faculty can assist CIDA and the executing agency by providing advice or specific short-term assistance.

Generalizations are always dangerous and the above view should not be interpreted to mean that universities should never be executing agencies or become deeply involved in such government projects. One exception is illustrated by the "Beekeeping Projects", which are cited by CIDA and participating countries as an outstanding success. Here the unique expertise in a very specialized field at two universities was harnessed to develop beekeeping systems at

the village level. In Kenya faculty from two Canadian universities assisted the Kenyan government in establishing an apiculture section, in training staff, and in developing an extension unit and an extension procedure for use at the village level. In 1971 there were virtually no beekeepers in Kenya; by 1978 their numbers had reached 7500. Honey produced by the villagers provided food directly and, in addition, was a source of cash. A survey showed that the cash was used in important ways to improve the family condition; for example, to finance education for children, to improve the water supply, or to purchase a goat as a source of milk. Beekeeping projects such as this were later started in Sri Lanka, Bangladesh, Tanzania, and Guinea.

Non-Governmental Organization (NGO) Projects

Faculty members have participated in some NGO projects. The importance of agriculture in NGO programming has increased in recent years and at present about 15 to 20 per cent of the NGO project funds are used for agricultural projects.[5]

Universities and the NGO sector have a much greater potential for interaction than has been realized to date. NGOs working at the village level have the organization and experience that could be of assistance to the universities; the universities, with a broad array of the expertise lacking in the NGO sector, can assist in NGO programs.

Many university faculty, deeply interested in development projects, would undoubtedly be prepared to provide professional advice to assist the NGO sector, giving their time at no cost.

Some faculty on sabbatical leave might find it profitable to participate in an NGO project or to make arrangements through an NGO organization to work at village level. Also, as new university employment arrangements emerge over the next few years, it is probable that more faculty will be available on a part-time basis. For example, one faculty member, who moved from a full-time to a part-time university appointment, has taken part in a food-system development project through the Canadian Executive Service Overseas (CESO). Other faculty members on leave have arranged for travel through CESO to participate in development projects.

It is recommended that the Canadian Council for International Cooperation (CCIC) determine the general need for university assistance in the NGO sector, and then work with the IDO to develop a system to inform faculty of the needs and to identify faculty interested in participating.

Canadian universities should conduct information programs to increase public awareness of the world food problem and of the need for Canadian development assistance. The NGO sector carries out a public-awareness program. It is recommended that the CCIC and IDO explore the possibilities for increased joint action in public-awareness activities.

Private Firm Projects

Until now most university involvement with Canadian consulting firms in the development sector has been through the use of university faculty for short-term assignments either to provide advice or to carry out a specific task, as is often the case in resources inventory projects. The short-term advisory type of participation should be encouraged by the universities because it is a means of increasing the capability of the Canadian private sector to carry out development projects. Another reason to encourage faculty participation is that experience in private sector operations can enrich the educational program. Normally, however, participation that requires only routine services is not a good use of scarce university resources.

Universities should not compete with the private sector, and there is no reason why they would. Universities should concentrate on education, research, and related institution-building; whereas the private sector should concentrate on management, general development, and production.

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IV. The Universities and Canadian Professional Expertise

The availability of Canadian scientific, technological, and managerial expertise is a major limiting factor in the Canadian capacity to provide assistance to projects. Because of this, CIDA is not able to undertake certain kinds of projects requested by the developing countries, or can undertake only a limited number. Similarly, private firms have experienced a shortage of qualified professionals.

Universities can assist in two ways: direct provision of faculty members to work on projects, and training professionals who will be available to the development agencies or firms.

University Faculty Resources

The survey revealed a substantial resource within the universities; 347 faculty members indicated they would like to participate in project activities. (Table IV.1.) Half of these had previous experience: 112 in assignments of up to one month, 95 of 1-12 months, and 87 in assignments of longer than one year. Of the 340 individual project activities reported by faculty in response to a question on overseas experience, 121 required living overseas for three months or longer and 219 did not, although they did require travel to the developing country.

At present 201 faculty are available for assignments of one month or less, 253 for 1-12 month assignments, and 93 for longer assignments. (Table IV.1.) It is interesting to look at the availability distribution in relation to previous experience. (Table IV.2.) Faculty with experience tend to fall into two groups. Those with less than one month, together with those with 1-12 months experience, generally (85 per cent) indicated that they were available for short-term assignments of up to one year; those with more than one year's expe-

Table IV.1 - Number of Faculty Members with Experience in and Available for Participation in Development Projects, by Discipline

Subject	Faculty Available	Experience on Projects: None	Up to 1 month	1-12 months	More than 12 months	Future Availability: Up to 1 month	1-12 months	More than 12 months
Agriculture								
Agric. policy and planning	6	1	3	2	3	3	4	2
Pedology and land inventory	11	5	2	4	3	5	7	3
Rural water resources and mgmt	9	3	4	3	2	9	5	1
Rural development	14	4	5	5	6	9	13	5
Crop breeding	17	8	5	3	2	10	11	4
Crop physiology and mgmt	22	11	7	5	7	13	13	6
Plant nut. and soil mgmt	18	9	4	6	5	11	15	8
Soil physics	3	2	1	0	0	1	2	2
Agrometeorology	4	1	3	0	0	2	3	1
Entomology	13	8	6	1	2	6	9	1
Plant pathology	10	8	1	3	0	3	10	3
Weed science	5	3	0	1	2	2	4	2
Animal breeding	11	6	4	1	0	7	7	1
Animal nutrition	19	8	6	5	4	15	10	3
Animal physiology and mgmt	14	7	6	4	4	9	10	4
Vet. science and animal health	80	20	9	6	7	13	25	6
Engineering*	25	15	6	5	6	16	18	6
Apiculture	2	0	1	2	2	2	1	1
Economics†	13	5	3	3	2	10	12	4
Extension and info. systems	9	3	5	2	4	7	9	4
Vertebrate pest control	1	0	1	1	0	1	0	0
Sub-total	256	127	88	67	61	152	188	67
Fisheries								
Biology	3	0	1	3	2	1	3	1
Ecology	0	0	0	0	1	0	0	0
Physiology and behaviour	1	0	1	1	0	0	1	0
Diseases, path. and parasitology	1	1	0	0	0	0	1	0
Production and mgmt	5	1	1	2	1	1	3	2
Aquaculture	2	0	2	2	1	2	2	2
Economics	2	0	1	1	1	1	1	0
Sub-total	12	2	6	9	6	5	11	5
Food and Human Nutrition								
Food science and technology	29	20	8	3	2	17	17	3
Food composition and quality	9	6	0	0	3	5	5	3
Food safety	1	0	1	0	0	1	1	0
Nutritional requirements and metabolism	4	3	0	2	0	2	3	0
Community nutrition	10	6	3	2	2	7	8	2
Sub-total	53	35	12	7	7	32	34	8
Environmental Impact	5	3	0	0	2	1	3	3
Social and Cultural Factors	8	3	0	3	4	4	6	4
Economics and Planning	12	2	6	9	6	6	10	5
Total	347	165	112	95	87	201	253	93

*Engineering relative to production, crop processing, and storage
†Production and marketing economics
Source: Project Inventory and Assessment, Appendix A.

rience were available about equally for short-term or long-term assignments.

Three-quarters of faculty with no experience preferred short-term assignments. This group also had a higher proportion of younger faculty members with 16 per cent in the under-35 age category compared to 5 per cent in the experienced group. (Table IV.3.) The centre sections of the age distribution curves were similar in both groups.

The distribution of available faculty by discipline is shown in Table IV.1. The small number of available faculty in fisheries subjects is the most striking feature of this table. If this is a fair reflection of the university resources available, it is understandable why university participation in fisheries projects has been low and why it has been mainly by way of faculty recruited individually for a project executed by a non-university agency. If the table gives a true

Table IV.2 – Number of Faculty Available for Participation in Development Projects in Relation to Amount of Past Experience

Amount of Experience	Number of Faculty Available		
	Up to 1 year	Over 1 year	Total
No experience	125	41	166
Experience			
Less than one month*	25	5	30
1-12 months†	37	6	43
More than one year‡	47	43	90
Sub-total	109	54	163
Total	234	95	329

*Faculty whose experience was limited to project activities requiring less than one month.
†Faculty with experience in at least one project activity requiring 1-12 months.
‡Faculty with experience in at least one project requiring over one year.
Source: Project Inventory and Assessment, Appendix A.

Table IV.3 – Age Distribution of Faculty Available to Participate in Development Projects

Age	No Experience but Available			Experience and Available			Total Available		
	Up to 1 year	Over 1 year	Total	Up to 1 year	Over 1 year	Total	Up to 1 year	Over 1 year	Total
<25	1	—	1	—	—	—	1	—	1
26-35	20	7	27	4	4	8	24	11	35
36-45	45	13	58	39	17	56	84	30	114
46-55	46	18	64	47	22	69	93	40	133
56-65	13	2	15	18	11	29	31	13	44
>65	—	1	1	1	—	1	1	1	2
Total	125	41	166	109	54	163	234	95	329

Source: Project Inventory and Assessment, Appendix A.

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estimate of the number of faculty available for future participation, universities will not make a major contribution to fisheries projects. This seems unfortunate in view of the number of faculty members working in fields related to fisheries in Canadian universities, of the significance of fisheries to Canada, and of the need for development projects devoted to fisheries.

Further study is needed to determine the real potential of Canadian universities in fisheries development activities because there is reason to believe this survey greatly underestimates the resources. Faculty with a fisheries interest are generally located in departments of zoology or biology, which include many other interests besides fisheries. It is therefore more difficult to focus on fisheries *per se* than on a field such as agriculture or veterinary medicine, where the interests are concentrated in departments and faculties or colleges. The diffusion of fisheries interests was probably the main reason for the difficulty in sending questionnaires to, and getting replies from, the fisheries group and for the lack of response by the chairmen of biology departments. It is suggested that IDO convene a meeting in cooperation with CIDA, IDRC, and the universities to assist in identifying university potential for development projects in fisheries, to determine how to encourage faculty interest and how the fisheries resources of the universities can be coordinated in order to mount special projects.

Although the total number of faculty interested in development projects is substantial, the picture is quite different at the operational level. The number of experienced people available at any time in a specific discipline is very limited, especially for projects of longer than one year. For example, even though 30 veterinarians are available, 20 have had no experience; a total of only six, with or without experience, are available for longer than one year, and some of these may be in specializations not in demand. Following this survey, CIDA contacted the faculty members who had shown an interest, requesting background information and stating that respondents would be considered for addition to the CIDA inventory of interested professionals.[1] The response was considerably less than to the survey in this study. This is further evidence of the limited faculty resources for CIDA projects.

Steps should be taken to increase the number of university faculty available for project activities in fields in which the development agencies have experienced shortages. Some possibilities are:

1. At present, faculty members who would like to participate find it difficult to understand CIDA's system. CIDA could compile a more comprehensive and complete inventory of available faculty. The basic information can be collected and updated by correspondence through the university office responsible for international programs or, if this does not exist, through the deans. This should be

supplemented by interviews on campus, conducted by CIDA food-system professionals. These interviews would place CIDA in a much better position to identify university faculty for an assignment.

2. CIDA could consider increasing the number of FAO Associateship awards to five annually. Experience with this system has been good.[2]

3. IDRC could provide five Development Associate awards annually in order for faculty with little or no experience to participate in research or outreach programs of the IARCs or other international or regional centres.

4. IDRC could give increased priority to and promote its Research Associate and Senior Research Associate programs for Canadians. Since 1970 only five Research Associate awards have been made to Canadian university faculty concerned with the food system. It is recommended that two person-years of awards for the professional development of Canadian university academics be made available annually for agriculture, fisheries, food, and rural development.

5. Links between faculty in Canadian universities and those in the universities of developing countries offer opportunities for gaining experience and developing lasting associations for ongoing joint activities. Opportunities for such links with developing countries are limited, although there are a number of programs for some form of linkage with industrialized countries, arranged by External Affairs.

6. CIDA now has a research associate program that gives scientists from developing countries an opportunity to collaborate with a Canadian scientist and gain experience in a Canadian institution. The return half of this arrangement is missing at present. CIDA could consider providing an opportunity for the Canadian faculty member to collaborate with the foreign scientist in his or her home country when that is the logical location to conduct the research.

7. For training purposes CIDA could attempt to include an inexperienced faculty member as part of a project team working on subjects in which a severe shortage of experienced people exists.

8. It is important for the university to have a clear policy on the role of international activities in the university plan. Of equal importance is the need to take account of international contributions by faculty so they are not overlooked in the reward structure, especially in the case of a faculty member on overseas assignment. When asked if they felt their international contributions were adequately considered in university salary, tenure, and promotion decisions, 27 per cent of faculty members answered in the negative. This concern was expressed in all universities, even in those with an announced interest in encouraging international programs. Apparently, even when the university actually does give due consideration to the

work, faculty members are still uneasy about the weight given to development activities compared to on-campus activities. Clarification of this matter is a factor determining the number of faculty prepared to undertake development project activities.

9. The faculty resources in food-system specializations in Canadian universities are inadequate to meet the needs of CIDA. It is crucial to the Canadian development effort that steps be taken immediately to correct this deficiency. The fact that CIDA devoted 30 per cent of the budget of the Bilateral Branch to agricultural projects in 1977-78, compared to 18 per cent in 1975-76, indicates an increasing need for professional agricultural and other food-system expertise.[3]

Human resource planning must be an integral part of overall planning. CIDA has sufficient information on hand to identify the subject fields in which programs are not possible or are severely limited because of scarce expert manpower. Similarly, the subject fields in CIDA programs that call for the largest volume of experts for the present mix of CIDA programs can be estimated with reasonable accuracy. The fields with shortages and of the greatest demand could be listed and quantified. Following this, funds could be allocated to place the required additional person-years in the universities. The intention is to create a human resource pool of an adequate size and type to meet CIDA's program needs.

It is recognized that a proposal by a federal agency to make funds available to selected universities to meet the agency's need for people can quickly become submerged in endless discussions about federal-provincial jurisdiction in education. The world food problem is too severe to permit this kind of superficial blockage to stand in the way of ensuring that specialized personnel is available for crucial development programs.

It is to the advantage of both the provincial and the federal authorities to meet this need. The advantage to the province lies in the fact that universities deeply involved in development activities are thereby in a position to offer a better environment for learning, and therefore a better quality of education for its students. The advantage to the federal government is that it can carry out development programs of the size and mix needed, instead of being limited to what can be mounted *ad hoc*. CIDA would be able to plan programs more effectively, knowing that it could draw upon a pool of human resources as needed.

A move by CIDA to provide these people and agreement by the universities, and if necessary the provinces, would clearly establish a policy of partnership between CIDA and the universities, and would formalize the commitment of the universities.

Another consideration that must be recognized by CIDA in assessing the need for extra person-years is the projected and inevitable budget problem facing the universities in the 1980s. Shrinking

provincial budgets on a constant dollar basis, combined with declining student enrolment in some disciplines, will reduce faculty numbers and place an increasing workload on faculty members. The net effect will be the increasing difficulty of freeing faculty for development project activities in the coming decade, by comparison with 1970-80.

The great strength of the universities as a resource to the aid agencies lies in the wide range of individual expertise they accommodate. The challenge is how to deploy this expertise effectively and with the least possible disruption to other program commitments of the university.

The universities employ the number of faculty needed to fulfil their teaching needs; in addition, faculty participate in research or other university-approved activities in the time that remains. Often, therefore, it is not difficult to free faculty for short-term development project assignments, lasting from a few days to three months, provided they can be completed during a non-teaching period. If the request for faculty members comes on short notice, it is more difficult to release the person because of the time needed to make arrangements to carry on the teaching and research programs, as well as other university and personal arrangements. As the length of the assignment increases, so does the difficulty in arranging for the release of the individual. The funding of extra person-years would increase university flexibility which, in turn, would result in more faculty being free to participate when needed. The principle in utilizing an extra person-year would not necessarily be to employ someone full-time in development projects, but rather to increase the complement by one person-year in order to release existing faculty for specific project tasks.

The number of person-years required should be determined by CIDA in consultation with the universities, but it would be approximately 25. This is the number of Canadian university person-years reported in the survey as being employed in CIDA programs in 1975, when a substantial number of both large and small projects were underway. The number of person-years reported for 1978 was 20, but this was an underestimate; the 1978 number exceeded 20 and was probably also about 25. If universities continue to make available the present 25 person-years and if CIDA provides an additional 25, the CIDA program could be increased substantially, and the shortage of experts in certain specializations could be alleviated.

Substantial funds would be required for such a program. The justification is that the quality of CIDA programs is determined by the amount and quality of the professional expertise present in all stages of the project and program systems: identification, planning, implementation, evaluation, and administration. CIDA's supply of expertise is grossly deficient at present. It must be recognized that a

solution to this problem – and the proposal under discussion is only part of a total solution – will require not only new resources, but also new systems for cooperation among Canadian universities in the more effective use of available professionals.

Plans would have to be made very carefully to assure successful placement of additional resources in the universities, and consideration should be given to the following:

1. The number of person-years to be funded would be based on the list of personnel needs prepared by CIDA in consultation with the universities. The number would be reviewed at intervals of two to three years, and adjustments would be based on program needs.

Based on an estimate of an additional 25 person-years, the placement might be: 15 to 18 in agriculture, agricultural economics, food, and veterinary medicine; three to four in fisheries; three to four in social sciences, exclusive of agricultural economics; one to three in special activities, such as consortia and networks.

If the development assistance budget of CIDA reaches the level of 0.6 – 0.7 per cent of GNP, the number of additional person-years required would probably be about 50.

There is a need to develop in the universities increased social science resources related to the food system in Canada. There are already social scientists in the universities who have experience and an interest in the food system; so a base exists upon which to build. The additional resources would act as a catalyst, substantially increasing the capability of universities to provide social science expertise devoted to the food system.

2. Criteria for the selection of the universities should include:

i) The unique demands on the Faculty of Agriculture and Food at Laval University. Canada has a heavy commitment of assistance to francophone countries. In addition, many of these countries, such as the Sahel group and Haiti, are in the low-income, food-deficit category and critically in need of assistance. Laval is the only francophone university with a faculty of agriculture in Canada and, in fact, in North America; consequently the demands on it are very heavy. The priority for person-year allocation would be Laval, provided, of course, that it wishes to undertake the commitment associated with participation.

ii) Past and current volumes of activity at each university. The inventory data provide a measure of this. (Table III.7)

iii) Funds for the extra person-years should go only to universities that have a declared policy on participation in development activities and that have an effective structure for the administration of development activities.

iv) Funds for the additional person-years should be placed only in faculties or colleges where there is a commitment to development activities and where the faculty unit enthusiastically wishes to participate.

Educational Programs for Canadian Professionals

Canadian private firms engaged in food-system development have indicated that Canadian university graduates do not have an adequate orientation to, or understanding of, development needs at the time of graduation. These firms do not have a sufficient volume of food-system projects to provide career opportunities for many food-system specialists. It does not seem appropriate to introduce university programs designed to produce specialists in food-system development at the baccalaureate level.

The appropriate action by universities is to assess the undergraduate curriculum to ensure students have the opportunity to develop an appreciation of international agriculture, especially as it relates to development. All undergraduate programs in agriculture should certainly include at least one course dealing with international agriculture, food, and development. One additional optional course that deals with development concepts, strategies, organizations, and approaches appropriate to the food system would be a valuable addition where this does not already exist. The University of Guelph has introduced a minor in tropical agriculture that includes a brief orientation visit to the tropics.

The above are useful approaches to orientation but a further step is needed to expose Canada's undergraduate students to development in action, to give them an opportunity to assess career prospects, and to accumulate some experience in development before or immediately after graduation. A cooperative work-study program could facilitate this. CIDA should annually fund approximately 20 undergraduate students for a three- to four-month work period in developing countries, working on development projects where the executing agency is a private firm, an NGO, CIDA, IDRC, another aid agency, an international or regional research centre, or a university.

These proposals deal with development of experience at the undergraduate level. IDRC's program of assistance for Canadian graduate students is useful and should be continued, but within a project framework. However, it is most important to have a post-doctoral program to provide experience at the scientist level. IDRC should establish a program of post-doctoral development awards, available to Canadians, to be tenable in an international, regional, or national research centre or in a university in a developing country.

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V. The Partners

The contribution of the universities to development in the next decade will be greatly influenced by the working relationships that are created between the universities and CIDA, the universities and IDRC, and the coordination among the three. This chapter provides background on the two major Canadian development agencies, on the International Development Office (IDO), which is the focal point for the university sector, and on the Liaison Committee for International Development (LCID), which is the coordinating body at the policy level.

Canadian International Development Agency (CIDA)

The bulk of Canadian development assistance is the responsibility of CIDA, an agency under the Secretary of State for External Affairs. Although the world food problem *inter alia* calls for the formulation of policy and strategy based on humanitarian grounds, other considerations play a major role in shaping CIDA's policy.[1] The goals of CIDA must be compatible with those of Canadian government foreign policy.[2] In addition, several departments with various and often conflicting interests in the aid system are associated with CIDA in policy formulation. Finally, desk officers, through their decisions on which projects to develop, exert a very significant influence upon actual policies. A current CIDA policy document lists food production and distribution and rural development as two of the seven areas that CIDA has identified for special emphasis.[3]

In carrying out its projects, CIDA states that it ". . .makes extensive use of Canada's domestic S and T [science and technology] capability and in particular the universities, no less than 20 of which having been involved to some degree in the Agency's program over

the last decade."[4] In 1978, CIDA had on its books 116 projects with university participation in the implementation phase. (Table V.1.) Of these, 24 per cent were projects related to the food system for a total of $27 million. Eighteen of the 58 bilateral university projects were in the food system, compared to 10 of the 58 in the Special Programs Branch. Food-system projects, therefore, now comprise a relatively large share of the total university activity in CIDA programs.

Table V.1 – Canadian University Involvement in CIDA Projects, 1978*

	Number of Projects		Funds Committed ($)
Program	Total	Food System	Food System
Bilateral	58	18	26 811 668
Special programs	58	10	112 047
Total	116	28	26 923 715

*Excludes projects for which only professional advice was involved.
Source: Information supplied by Special Programs Branch and Resources Branch, CIDA.

Faculty members and university administrators repeatedly cite difficulties and frustrations in working on CIDA projects. Food-system projects are often complex, labour intensive, and environmentally sensitive because they frequently deal with biological organisms and interact with local environmental conditions. Schedules, therefore, frequently need revision. Because these projects are labour intensive, scheduling and progress are heavily dependent upon the availability of people with specific skills. Further, because they deal with dynamic biological systems, considerable authority for day-to-day decisions must be assigned to the on-site manager.

Planning and project officers, administering bilateral food-system projects, usually do not have the type of expertise required for efficient management of food-system projects and for ease in dealing with university personnel. Food-system expertise is found in the Resources Branch of CIDA, and not in the Bilateral Branch where the administration of the projects is located. Although recent changes within CIDA have placed the advisers in teams for processing projects, project administration remains in other hands. CIDA would be in a stronger position to manage food-system projects if specialists in agriculture, fisheries, and rural development participated more directly in the continuous administration of the projects. CIDA should move immediately to the third stage of reorganization under consideration, which envisages moving the specialists from the Resources Branch to the Bilateral Branch and locating them in the regional groups. This would ensure that each regional group had a basic competence in these specialized areas, and the specialists would be in a position to apply their expertise more effectively in CIDA operations.

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Transferring the existing specialists will not completely solve the problem of inadequate expertise in food-system matters in the Bilateral Branch. Additional expertise could come from two other sources. Recruitment strategy for staff replacement should be based on the needs for each type of specialization necessary within each of the three regional groups. Given the current rate of staff turnover, careful recruiting should result in rapid fulfilment of the plan. In addition, it is suggested that special short courses on the food system be designed to assist some existing staff who are not specialists to become proficient in this field. The courses should be designed jointly by CIDA and the universities. Specialists with development experience in CIDA, universities, government departments, and the private sector, as appropriate, would take part in the courses.

Similarly, CIDA field officers handle an extremely broad array of projects. More effective project supervision and assessment would occur, and more encouragement and assistance could be given to project implementation personnel in the field, if the CIDA officers were more knowledgeable about the projects being supervised. Two changes are needed to accomplish this. First, it is necessary to have more than the present number of CIDA officers located in the field. Currently, 50 officers deal with over 2000 projects; with the exception of special cases, this means that the field officers simply do not have the time to become deeply involved in each project. Second, field officers for each of three regional groups should include specialists in agriculture, fisheries, and rural development, and they should operate from regional offices, supervising the food-system projects throughout the region.

Another important problem is that the turnover rate is often so high that it interferes with smooth and orderly administration and working relations. It is quite common for a faculty member responsible for a project to deal with three or four project officers. Each of two current projects have so far had six different project officers. One university project, underway for only a year, has experienced a turnover of three project officers. A review of the system is needed to promote greater continuity in project administration.

The solution seems to require a major change in personnel policy. Currently, the job classification system applicable to Bilateral Branch officers does not provide adequately for career advancement within CIDA. Consequently, experienced officers move to other units of the federal agencies and departments. In contrast, the specialists within CIDA fall under a job classification system that provides for career advancement as specialists within CIDA. This is the kind of arrangement required for the project officers who, with adequate special training and experience, should also be considered as specialists – development specialists.

The establishment by CIDA in 1979 of the CIDA-Universities Co-

ordinating Committee on Higher Education was an important step. This is an internal committee comprising one staff member from each of the Bilateral, Special Programs, Policy, and Resources branches. It provides a formal internal mechanism for communication and for the development and coordination of procedures related to university activities. In addition, the establishment in 1978 of a university unit within Special Programs should facilitate university discussion with that division, which is likely to experience substantial growth in food-system projects. Universities will continue to be mainly associated with two branches – Bilateral and Special Programs – for presentation of project proposals and for project implementation and professional advice.

CIDA has no policy board or advisory council that includes members of the universities; hence there is no formal opportunity for university input at the policy decision level, essential to a full partnership approach. The newly created LCID, which comprises senior staff of CIDA, IDRC, and the universities, does provide an opportunity for input and discussion at a level close to the policy decision level. This is satisfactory provided CIDA is committed to serious participation in the Committee, which appears to be the case on evidence from the past year. CIDA is commended for this approach.

International Development Research Centre (IDRC)

The IDRC, established in 1970, is an institution of the Canadian government, being national in its charter and financing but international in its board of governors, its staff, and its operations.[4] Policy is set by a board comprising 11 Canadians and 10 who can be non-Canadians. As a corporation, and with this board arrangement, it is free to pursue a policy of assistance based only on humanitarian grounds and the needs of developing countries.

The present board includes four members of Canadian universities and seven other academics. With 11 of the present 16 board members having university connections, the university view is well represented at the policy level.

The objectives of the IDRC and the concomitant activities are:

> "to initiate, encourage, support and conduct research into the problems of the developing regions of the world and into the means for applying and adapting scientific, technical and other knowledge to the economic and social advancement of those regions, and, in carrying out those objectives, (a) to enlist the talents of natural and social scientists and technologists of Canada and other countries; (b) to assist the developing regions to build up the research capabilities, the innovative skills and the institutions required to solve their problems; (c) to encourage generally the coordination of international development research; and (d) to foster cooperation in research on development prob-

lems between the developed and the developing regions for their mutual benefit."[5]

In carrying out the objectives the Centre has emphasized "(b)".

"From the day of its creation, Centre support has focused principally on building the research skills of scientists and technologists in the developing regions. This 'indigenization of research' reflects the outstanding and unique style of the Centre's operation.

"The Centre does not carry out any 'in-house research', and engages scientists from the industrialized countries only when it is necessary to assist in establishment of research teams created in the developing countries, by providing them with the appropriate scientific framework, or when it is necessary to support basic research or particularly sophisticated research which at present is beyond the capabilities of developing countries due to lack of expertise or facilities."[6]

When IDRC was established, the university community looked forward to the opportunity of participating. In a major report in 1970 on Canadian universities in international development, Walmsley stated:

"It is obviously too soon to predict just how much Canadian universities will be involved in this new effort of the Canadian government to seek answers to some of the problems relating to the developing countries. But since it is basically a research institute, in order to succeed in its objectives it will obviously require the cooperation of Canadian universities. Its demands for teachers and researchers may encourage universities to become much more deeply involved in development work than they have been in the past, and also point the way to increased inter-university, as well as international, cooperation.

"The establishment and operation of the centre should have an important impact on the universities and the experience gained by participating Canadian university personnel will be of immense benefit to all concerned, but perhaps most importantly to graduate students both here in Canada and in the developing countries. In the immediate future and for some time to come there will be very great need for large numbers of trained personnel to work in development fields. The centre should help Canadian university professors to become more involved and thus more experienced internationally. . . ."[7]

Early developments indicated that universities would participate extensively. Program officers of the Agriculture, Food, and Nutritional Sciences Division were located at four universities; major projects, such as those in cassava, triticale, and trypanosomiasis, were initiated with substantial university participation; a number

of smaller research projects were contracted to faculty; and faculty were invited to provide professional advice. Faculty have taken part in 73 IDRC project activities. This degree of participation has contributed significantly to the growth of international experience in the universities and of university capability to participate more effectively in development activities.

Most projects of the past nine years were initiated during the early years, and many of the large projects were funded by CIDA and managed by IDRC. Funding by CIDA has ended, and the projects have either been or are in process of being phased out. This is one of the main reasons for the decline in the amount of university participation in IDRC progams. Few new projects have been initiated during the past three years. The trend is clearly toward less participation by universities in project implementation and, if this continues, in two to three years participation will be relatively insignificant. However, university faculty will probably continue to act as consultants, providing as much professional advice as they do today.

University faculty who have worked closely with the Agriculture, Food, and Nutrition Sciences Division are generally very favourably impressed with IDRC. Objectives and strategy are defined, administrative procedures are clear, decisions are made quickly, and program management is supportive. The main question faculty ask is why there is so little opportunity for Canadian faculty to participate in IDRC activities.

Universities have not had an opportunity to participate in programs concerned with the food system in other divisions of IDRC. It is well understood that expatriates working at the local and village levels in social science projects have limitations. Despite this, however, Canadian social science resources can contribute to some aspects of development.

Quite correctly, IDRC has placed its emphasis on the development of the research capability of developing countries and regions and has assigned the bulk of its research budget to projects conducted in the developing areas by national, regional, or international research units. The approach has been highly successful and should continue. The question raised for discussion now is whether institutions in the developed countries – in this case the Canadian universities – are being utilized adequately by the world system of research in its attack on the provision of the basic human need: food. Item (a) under the activities to be employed by IDRC in reaching its objective makes provision for the Centre "to enlist the talent of natural and social scientists and technologists of Canada. . . ." Hence IDRC is in a position to utilize the Canadian universities more fully if it chooses to do so. It is suggested that IDRC should study this question thoroughly, including holding a workshop for an exchange of views between IDRC and the universities.

A number of other countries have, or are considering, arrangements that allow greater university participation than is available in Canada. In 1975, the United States enacted the Title 12 legislation designed to provide sustained support for building the capability of American universities in respect of food, nutrition, and agriculture related to development. This means that the large experimental station system, historically effective in its efforts to improve the domestic food system, now also has the mandate and the resources to expand its activities into the sphere of international development. There have been implementation problems, but the system is developing.

Later, in 1977, a major study by the National Academy of Sciences on research priorities in food and nutrition recommended that the United States research system should increase its international scope.[8] The study recommended that the United States "should move vigorously and imaginatively to encourage collaborative relationships between international centers and research groups in the United States." The study recognized the need to develop the indigenous research capability of developing countries. At the same time, it indicated that a substantial amount of the research needed in the near future, especially some of the basic research, would have to be carried out in developed countries where most of the scientific resources now exist, and it suggested that there should be increased collaboration between the United States and research groups in developing countries. In 1978 the United States announced its intention to establish an Institute for Scientific and Technological Cooperation (ISTC), which would operate in the same general pattern as IDRC and, among other functions, would promote the interplay between research units in the United States and those in developing countries.[9]

The United Kingdom has an arrangement for university participation in collaborative research with the IARCs. In addition to the multilateral funds that it provides to the centres, the Overseas Development Ministry (ODM) makes available a block of funds for IARC-related research in British universities. In 1978, projects were funded under this program in seven universities.

In the Netherlands, universities have long been deeply involved in development activities through the Netherlands Universities Foundation for International Cooperation (NUFFIC). One of its programs (PUO) deals with the links between Dutch universities and those in developing countries.[10] A recent Dutch initiative was the establishment of the Advisory Council for Scientific Research in Development Problems (RAWOO). Its purpose is to develop a national policy embracing all scientific research performed by Dutch universities, research institutions, and industry in the development field.[11]

RAWOO plans to provide advice to government and to the re-

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search units on the way in which development-related research in the Netherlands can be organized most efficiently and effectively. RAWOO's budget recommendations give an insight into the proposed strategy. Of the funds available it is proposed that 60 per cent be allocated to research into internal problems of the developing countries, with three-quarters of this amount reserved for research in the developing country under a cooperative link with the Netherlands. Twenty-five per cent is to be allocated to research into the relationship between rich and poor countries, with half of this conducted by researchers from the developing countries; 5 per cent is to be allocated for research into structural problems within the Netherlands, with three-quarters of this spent wholly in the Netherlands; and 10 per cent is to be held in reserve. Under these arrangements Dutch universities have an opportunity to participate in program planning and in the implementation of some of the research. A partnership is much in evidence.

Similarly, universities participate in a significant way in the program of the Swedish Agency for Research Cooperation with Developing Countries (SAREC). For example, five of the eleven members of the SAREC board are university professors; hence universities are deeply involved at the policy level.[12] SAREC also has a program to encourage the participation of Swedish researchers in cooperative work with developing countries. In 1978, 87 projects for research at Swedish institutions were funded. These projects, together with some institutional support, accounted for 5.8 per cent of the budget commitments of SAREC in 1978. In 1979 it was planned that 8.6 per cent of the budget would be allocated to development research in Swedish institutions.

All of the four countries cited have initiated arrangements for greater university participation in development research than exists in Canada under current IDRC and CIDA policies. These arrangements under ODM, RAWOO, SAREC, Title 12, and ISTC have all been established since the formation of IDRC; decisions to involve the universities more deeply have been made in response to current development needs.

In a 1979 study[13] by the Ministry of State for Science and Technology, it was recommended that Canadian policy related to scientific activities in support of developing countries be expanded to utilize Canada's domestic scientific resources, that these resources be applied through cooperative arrangements with institutions in the developing countries, and that IDRC take the lead in this new venture.

International Development Office (IDO)

The IDO was established in 1978 after nearly a decade of discussion and advocacy following publication of the Walmsley report.[14] Its

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purpose is to facilitate cooperation and coordination among Canadian higher education institutions in the area of international development programs. It operates under the policy authority of the LCID and under the administrative authority of the executive director of AUCC.[15] Its functions are as follows:

" 1. Act as a clearing house to facilitate the exchange of information among Canadian universities interested or involved in international development and comparable organizations in developing countries.

2. Review means of developing and coordinating a more adequate Canadian universities' resource base for international development and submit proposals for strengthening this base to the LCID.

3. Using the IDRC and CIDA university networks, establish communication procedures whereby universities will be informed more effectively about the higher educational needs of developing countries and the work of development agencies: more particularly,

i) upon request by Canadian, and occasionally other development agencies, seek from the universities information on possible specialized resources which could be made available for development or assistance programs;

ii) act as a channel for the presentation to the agencies of the views of the Canadian university community on their participation in international development.

4. Foster links between Canadian universities and universities in the Third World by:

- providing model terms of agreement;
- advising on costs and standards;
- proposing appropriate financial support for linkages, including support for both staff secondments and for joint training and research projects, to the LCID.

5. Analyse and recommend appropriate terms and conditions for staff secondments and contracts, and report on them to the LCID.

6. Report to the LCID on any problems that may arise between the universities and the international development agencies and propose possible solutions.

7. Maintain active contact with such organizations as the Inter-University Council for Higher Education Overseas, the Association of Commonwealth Universities, l'Association des universités partiellement ou entièrement de langue Francaise, the Association of African Universities, etc., with the aim of providing liaison.

8. Prepare appropriate progress reports on the activities of the Office and on Canadian university linkages with universities and institutions in developing countries.

9. Coordinate the information flow to and from the university liaison officers.

10. Make arrangements for meetings of the LCID, including preparation of background papers, provision for secretarial services and supervision of actions arising from decisions taken by the LCID."

An advisory committee named by the Council of University Presidents of Canada advises the director of IDO and the LCID. The committee comprises 12 university presidents, named by regional university groups, and 8 faculty members at large.

IDO, concentrating on the critical issues set out in these terms of reference, can play a key role in creating an appropriate environment and policy framework within which university participation in international development can thrive. It is essential that the Office, as a unit attached to AUCC, operate in an efficient manner, providing rapid response to requests for information and assistance from the universities in order to gain their confidence.

IDO should concentrate on developing policies and appropriate systems to expedite the international development activities of the universities. It should not become another aid agency such as NUFFIC or IUC, which were developed in countries without a unique organization like IDRC. IDO and AUCC should link the universities to the existing federal agencies, IDRC and CIDA.

IDO has been very effective in its first year. Consequently, the universities have a strong central unit that can work effectively with the two federal aid agencies and with other organizations concerned with development cooperation.

Liaison Committee for International Development (LCID)

The AUCC-CIDA Policy Liaison Committee, which had been in operation with minimal success since 1973, was reorganized in 1977 as the LCID. The goals of LCID are to explore means by which Canadian university relations with Third World universities could be maintained and developed; to explore ways in which the Canadian university resource base for participation in Third World development could be improved and expanded, as part of the general planning in Canadian universities; and to continue to foster the closest cooperation possible among CIDA, IDRC, and the universities.[16]

Membership consists of the vice-presidents of the Bilateral, Special Programs, Policy, and Resources branches of CIDA; the senior vice-president of IDRC; four university presidents named by the Council of Presidents; the director of the IDO; and the executive director of AUCC. The LCID offers real promise as a mechanism for communication at the senior administrative level, although its power to

effect change lies only in its composition. Success depends upon adequate staff work to support its agenda, activities, and follow-up. From the university side, the IDO office should provide the necessary support; from the CIDA side, the internal IDRC-Universities Coordinating Committee for Higher Education should provide the support. IDRC should consider establishing an internal IDRC-University Committee to deal with matters concerning Canadian universities in relation to IDRC and to provide support as required by IDRC for the LCID activities.

LCID has been effective during its first two years of operation. The mechanism now exists for effective coordination among the universities, CIDA, and IDRC. Its success is dependent on the commitment of each partner. Of concern at present is the nature of the participation of IDRC following abolition of the office of senior vice-president in 1979.

Cost-Recoverable Technical Assistance (CRTA)

The Department of Industry, Trade and Commerce established the CRTA program in 1978. Its main concern is with trade, in which mutual advantage to both parties is expected. Educational services are one component.

Universities must be aware of this program because they may be contacted as a result of contracts arranged by CRTA. For example, the first contract under the program was placed with the Canadian Bureau for International Education (CBIE) in 1978 for the placement and administration of a multi-year program under which 500 Nigerian students will study in Canada annually, although most students will be in the non-university sector. Future contracts for educational services will be arranged by the CRTA liaison unit and the appropriate provincial ministry of education. Middle-income developing countries, including the OPEC group, are candidates for this cost-recoverable program.

The program will use as its vehicle technical cooperation and government-to-government agreements, and then arrange contracts with private firms, universities, and other groups in Canada to carry out the activities. This means that there could be new demands on university food-system resources and one more government agency for the universities to deal with. CIDA, ITC, and IDO should collaborate at this early stage in the development of CRTA's program to help develop an integrated approach and the appropriate mechanisms for university participation.

VI. Synthesis and Future Direction

The role that Canadian universities could play in supporting the Canadian effort to assist developing countries in their search for self-reliance in food is of prime importance. The main points are discussed in this chapter but additional suggestions are included in Chapter II, which deals with educational programs, and in Chapter III, which deals with the projects.

During the past 11 years, the universities have made a significant contribution to development cooperation activities in the food system, both in student training and in development assistance projects. In 1978, 20 per cent of the students enrolled in masters programs and 39 per cent of those enrolled in doctoral programs in faculties and colleges of agriculture and veterinary medicine in Canada were from the developing countries. Over the 11-year period covered in this study, faculty members participated in 382 food-system development assistance projects. The 1978 faculty input was 32 person-years. As a result, Canadian universities have accumulated experience on how to operate development projects successfully, and are aware of the associated problems. Consequently, they are in a much stronger position now, compared to 1968, to participate in development programs.

A Strategy for the Next Decade

All Canadian universities with faculties or colleges of agriculture, veterinary medicine, and home science, and with major fisheries groups, should be deeply concerned with development cooperation activities in the food system.

One reason for participation, perhaps the most powerful, is world need. On humanitarian grounds alone all institutions in soci-

ety that can assist the developing countries in increasing their capability to meet the basic human needs of their people should feel a responsibility to do so. A second reason is that some Canadian universities have a great deal of experience in working with research programs and outreach projects, such as agricultural extension, designed to meet local needs. This experience can be shared with universities in developing countries that have an urgent need for it.

Another reason for participation is the debt that Canadian universities still owe the world university system. Until recently, Canada itself was a developing country in terms of graduate education in many, if not most, aspects of the food system. A high percentage of the teaching staff currently in faculties and colleges of agriculture and veterinary medicine, and in many biology, home science, and social science units, obtained their graduate training elsewhere because of the lack of adequate high quality graduate programs in Canada. Now that such programs exist, it is appropriate that Canada repay its debts.

Furthermore, participation has a profound impact on the milieu for teaching and learning. The effects on faculty of direct involvement and the cultural enrichment resulting from the interchange among students from different cultures make a university more "universal" in character and approach, and therefore more able to perform its educational role with relevance to an increasingly interdependent world.

If a university chooses to take a significant part in international development activities, this objective must be stated formally as the first step in creating a climate that encourages and facilitates faculty participation. Based on faculty response to this study, another critical step is recognition by the university of faculty contributions to international programs during tenure, promotion, and salary deliberations. In addition, universities must ensure that faculty members are aware their work is being recognized. The university can acknowledge faculty contributions only when they are known. At present university records in this regard are generally incomplete. This deficiency could be corrected if the university required faculty to obtain university approval for participation in sponsored development projects, in much the same way as applications for external research funds.

A university with a commitment to international cooperation programs should establish an international office as a focal point for liaison, coordination, and information assistance to participating academic units and faculty. If the university plan calls for substantial activity in graduate programs for students from developing countries, an international student adviser and special non-academic services for international students should be provided. The

international office would provide a reservoir of accumulated experience to assist faculty in new projects, a link with the IDO and the aid agencies, and a means of facilitating continuity.

At the current level of international activities, university faculty resources are limited and severely strained in fields such as agriculture and veterinary medicine. Resources will always be a limiting factor. Consequently, it would be helpful to establish a basic strategy for university involvement in development activities and to establish priorities to concentrate the effort. The framework proposed for such a strategy includes five elements.

1. The university sector should concentrate its activities on the fields in which the university is unique in relation to the other participants, namely federal government departments and laboratories, some provincial governments, and the NGO and private sectors. This will maximize opportunities for cooperation and coherence in the total Canadian effort.

2. Universities should concentrate their efforts on the things they do best.

3. The university approach to the selection and conduct of development activities should be to promote self-reliance in the developing countries.

4. The university approach should also promote the development and use of appropriate technology.

5. Universities should integrate their activities with those of CIDA and IDRC in a cooperative approach in order to maximize the impact of the Canadian effort in development cooperation.

Based on this framework, it is suggested that Canadian universities concentrate their resources and efforts in development assistance on four categories in the following order of importance: building indigenous university capacity; collaborative research; general development projects; and public awareness in Canada.

Category 1. Building Indigenous University Capacity in Developing Countries

Canadian universities should give priority in their development cooperation activities to assisting universities in the developing countries with their evolution. Also CIDA should place greater emphasis on assisting developing countries to strengthen their universities, concentrating on projects concerned with agriculture, fisheries, and rural development. In recent years it appears that CIDA has reduced its emphasis on this type of assistance.

Strong universities in the home country or region are vital to development. Universities are one – although only one – of the necessary components of an educational system to develop, dispense,

and manage the knowledge that underpins development. The universities in developing countries are responsible for producing the scientists, engineers, professionals, and some of the managers required; for evaluating and modifying existing technology, and developing new technology; and for sharing in the promotion and extension of the use of new information. Because their primary role is the development of highly qualified manpower, their greatest impact on development is an indirect one through their graduates. If a university is operating effectively, developing in its graduates the attitudes needed for success in guiding the development process, it can be a powerful force in development. In addition, if a university is doing significant research on important national problems and is active in outreach programs, it will have an important direct effect on development.

In 1969, Wortman stated that a major weakness in world agriculture was the inadequate capability of the faculties and colleges of agriculture in developing countries to contribute to development.[1] Resources were grossly insufficient to provide a reservoir of knowledge for faculty to draw upon for teaching or research relevant to the region. Faculty with the required training were often scarce. Students who entered university, generally with little practical experience, were not provided with adequate "hands-on" training. As a result, all too often graduates were unable to deal adequately with production problems. Faculty were more interested in research on topics of current interest in the advanced countries than on problems facing their own. Extension was not a significant concern. Faculties of agriculture in the universities lacked resources, and did not have a strong commitment to meeting specific food-system needs of the countries in which they were located. Wortman stressed the need for assistance in strengthening agricultural faculties, but cautioned that this should be provided to universities that directed their efforts toward local needs.

Although the universities in developing countries were generally established on the model of the traditional university, which emphasized a liberal education and a research program aimed at the search for truth for its own sake,[2] the emerging model is very different. For example, according to Koinange,[3] representatives of the Association of African Universities defined the role of the African university in relation to development as follows:

> "A truly African university, acknowledging the need to transform Africa into the twentieth century, must yet realize that it can best achieve this result by completely identifying itself with the realities of a predominantly rural setting, and the aspirations of unsophisticated but highly expectant people. It follows that the emergent African university must henceforth be much more than an institution for teaching, research and dissemina-

tion of higher learning. It must be accountable to, and serve the vast majority of, the people who live in rural areas; it must be committed to active participation in social transformation, economic modernization, and the training and upgrading of the total human resources of the nation, not just a small elite. The university must also concern itself with the inter-African and international problems."

This group further defined the functions of an African university as:

"1. Pursuit, promotion and dissemination of knowledge, especially the type of knowledge which is immediately useful to the generality of the people and therefore locally oriented and motivated;
2. Research, both fundamental and applied, especially research into local problems that will contribute to the amelioration, in particular, of the life of the ordinary man and the rural poor;
3. Provision of intellectual leadership;
4. Manpower development, provision of secondary and primary school teachers, agricultural extension workers. . .;
5. Promotion of social and economical modernization; and
6. Promotion of intra-continental and international understanding."

Adoption of these kinds of functions by universities would transform the traditional university, cause it to interact with the region at the grassroots level, and increase its impact on development in the country.

Recent studies by Thompson and Fogel[4] and Thompson *et al.*[5] provide evidence that the universities are evolving according to the model outlined above. They found that although universities in the developing countries had not contributed as much to development as they could have, a wide range and significant number of innovative programs and structures are in place. The innovations relate to an extension of the traditional functions of the university. They add a service function that focusses on the country's development needs in terms of outreach and extension programs; research is directed to local needs, with greater participation of rural people in setting objectives and in the conduct of the research. The innovations also promote changes in the educational process, such as the introduction of work-study and service-study concepts. Also encouraging is the view recently expressed (1977) by the deans of agricultural faculties in developing countries that their faculties and universities should re-direct and expand their activities to play a greater role in national development, and they cited examples of progress.[6] Not all, however, are satisfied with the rate of progress.[7]

"**Stage 1**. Formation of . basic national educational system including primary schools and vocational, teacher training, and

preuniversity secondary schools, which may be extended into short cycle (two-to-three-year nondegree) postsecondary programs. Ordinarily, this system provides for more than 10 per cent of the potential student body.

"**Stage 2**. Formation of a university offering undergraduate studies leading to first professional and/or liberal arts degrees. In most cases, there are no graduate studies and research programs at this stage. Parallel programs in higher technical training may be offered outside the university.

"**Stage 3**. Political movement to generalize the basic national educational system, as described in Stage 1, to reach up to 50 per cent of the 6 to 12 age group.

"**Stage 4**. Maturation of the university, with emerging graduate studies and research programs that relate the university to national problems. At this stage, the university can offer full faculty training in some fields.

"**Stage 5**. Extension of the university's role. The university can now reach out to communities, develop new methods of educational delivery, and adjust to the political necessities of national service programs."

Because of the major progress made by developing countries in building up their university capacity during the past two decades, development assistance needs are quite different now. For example, Canadian universities no longer have a major role to play in the undergraduate training in Canada of students from developing countries. Encouragement of an increase in undergraduate students in Canada would deter the further development of this capability in the home country and region and, therefore, the achievement of self-reliance.

Although major advances have been made in recent years, self-reliance in the university sector in most developing countries is still only on the horizon. Assistance at the Stage 2 level is still a need in some countries. The current Haiti-Laval project falls into this category. Projects at this stage require assistance on a broad front, from graduate training in Canada to curriculum and physical resource development. Increasingly, the need is for assistance at Stages 4 and 5, including assistance in designing specialized graduate programs, graduate training and special courses for faculty, and cooperative research. The Pernambuco-Saskatchewan project in Brazil, whose object is the development of a graduate and faculty research program in soil science, is an example of Stage 4. Over the next decade most requests for assistance will relate to Stages 4 and 5.

Universities in the developing countries are responsible for determining the kinds of assistance needed to help them reach their goals. Canadian universities, as part of the international university community, should be prepared to receive the requests and respond

where possible. In all cases partnership arrangements should be made. The types of activities most likely to be in demand, which are most compatible with Canadian university capabilities, are described below.

1. Graduate training for future faculty members.
In the decade ahead Canadian universities will have an important role to play in graduate education in the developing countries, particularly when such a capacity does not exist and when Canadian participation is compatible with developing indigenous university capability.

It is essential that future faculty members undertake their graduate studies where the program is of the highest quality in terms of facilities, guidance, and orientation. In some cases this means study in the home country or in the region. In others, however, it still means study in a country such as Canada. A Canadian university, in accepting students, should recognize that its program, which may be of high quality for a Canadian student, may not be appropriate for a student from a developing country unless special provisions are made. The dean of graduate studies, together with the international office and international student adviser, should draw the attention of faculty supervisors to the special needs of graduate students from developing countries and to related special responsibilities of supervision.

The difficult problems of the food system demand a high calibre of scientific knowledge; hence the first consideration in graduate programs for students from developing countries must be to provide the highest quality of experience in the scientific method and a thorough understanding of existing knowledge in the specialization. In addition, the programs should be oriented to development as much as possible. The current policy of CIDA and IDRC to provide an increasing percentage of their support for graduate training, as a component of a development project, helps accomplish this. Another means is thesis research carried out in the home country or region, as long as the facilities and supervision are available. This is an expensive system in terms of both money and time, but it is effective and should be increased substantially. Finally, Canadian universities should consider introducing a seminar series or course on the development process, development policy, research and outreach strategy for development, and the international development assistance system. All students from developing countries should be encouraged to enrol in it at some time during their graduate study.

2. Projects to strengthen developing country universities
Canadian universities should give priority to requests from univer-

sities in developing countries to collaborate in institution-building projects, whether of the comprehensive type or of the specialized type intended to build basic capability. When they have acted as the executing agency for CIDA in such projects, Canadian universities have been successful.

3. Special programs

There is a growing need for specialized courses, workshops, and study periods to deal with specific topics. These include teaching methodology; operation and participating research techniques; research planning and management in a development setting; specialized discipline topics; laboratory methods; extension, outreach and communication systems; and others that will continually arise. As more developing countries move into Stages 4 and 5 in the evolution of their universities, the demand for this type of special activity will increase substantially.

As well as participating directly in the three activities described above, it is most important that Canadian universities should respond positively to requests from CIDA for faculty members to provide professional advice as consultants on institution-building projects.

Category 2. Development Research in Collaboration with Developing Countries and Regions

The research resources of Canadian universities should be used to a greater extent during the next decade to assist developing countries in meeting their research needs. Activities appropriate to Canadian universities in relation to development research are listed below in order of importance.

1. Consultant assistance for research projects, on request, to IDRC, CIDA, other aid agencies, NGOs, developing country governments, and others.

2. Graduate training for Canadians who are planning careers in international research.

3. Collaborative research required by an international or regional centre, which neither the centre nor a developing country is in a position to undertake alone.

4. Collaborative research with universities in a developing country on projects important to development in the country, which could increase the research volume, assist in building the indigenous capacity of the universities, and expand the experience of Canadian faculty in development research.

5. Research on the development process. The re-thinking of, and changes made in, development strategy in recent years indicate a

lack of knowledge about the process of development. A concerted research effort is likely to yield information that will improve the approaches now in use.

Category 3. General Development Projects

Projects and programs such as resource inventories, planning units, production schemes, and irrigation plans fall into this category. Universities should undertake projects and activities within this category only when the university can make a unique contribution. The activities appropriate to universities are listed below in order of importance.

1. Consultant assistance on general developments projects, on request, to CIDA, other aid agencies, NGOs and the private sector.
2. Graduate training for staffing government units and national research centres.
3. Special courses and other special training for personnel in government units and national research centres.
4. Acting as executing agency or participant in projects strengthening national research centres or government specialty units.
5. Acting as executing agency or participant in development projects for which the university has a unique expertise.

Category 4. Public Awareness in Canada

Canadian universities have an important role to play in increasing public awareness in Canada of the world development problem and of the need for Canadian participation in programs that assist developing countries to build an indigenous capability. IDO and the Canadian Council for International Cooperation (CCIC), which has a public awareness program, could profitably explore the possibilities for joint action between the CCIC and Canadian universities in public awareness activities.

The universities can make a unique contribution to the development of Canadian policy. They have expertise in a broad range of disciplines related to development. Faculty members have experience at the grassroots level, through participation in NGO projects, and in various aspects of the project system of the aid agencies. It is suggested that IDO work with the CCIC to develop a forum for the discussion of public policy related to development.

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University Resources

There is a serious shortage of faculty, especially of those experienced in development work, to meet the requests from CIDA and other agencies. An improved inventory system is the first need in utilizing existing expertise. IDO could establish and maintain an inventory of faculty interested in food-system projects and make it available to all aid agencies and the private sector. Alternatively, the inventory could be maintained by the consortium of universities discussed later. IDO could work with the CCIC to determine the need for university assistance in the NGO sector and to inform faculty of the opportunities. CIDA should also establish and maintain a more comprehensive inventory for its internal use.

Approximately 150 faculty members, who have had no experience, indicated an interest in participating, and this resource should be developed. CIDA could assist by increasing to five the number of Canadian-financed FAO associateships awarded annually to allow faculty to gain experience in the FAO system. CIDA could also consider expanding its present research associate program for personnel from developing countries into a partnership arrangement. Under this, the Canadian university faculty member, collaborating with the visiting scientist, has an opportunity to continue the collaboration in the developing country when it is the most appropriate location for the research. Similarly, IDRC should consider reinstating its research associate program (Canada), which was suspended in 1978, but modify it to include two components: one would be similar to the FAO program and would operate within IDRC, and one would be for faculty to collaborate in research projects at the IARCs. As mentioned previously, another possibility for building experience would be for CIDA, where possible, to include a faculty member, inexperienced but interested in development work, on a project team in specializations where there is a serious shortage of experienced people.

Even if the above steps are taken, the faculty resources will fall far short of the need. The number of faculty members available for development activities should be augmented. Because the food problem is so important and because the Canadian effort in food-system development projects is so heavily dependent upon university resources, it is suggested that CIDA consider placing about 25 positions (person-years) among universities that wish to participate in an expanded program. The exact number would be determined by CIDA based on its assessment of the shortages in various specializations. Using this approach, the Netherlands has established 40 such positions at the Agricultural University of Wageningen. Additional information is set out in Chapter IV. Such an approach was proposed to CIDA previously by the Deans of Agriculture and Veterinary Medicine.[9] This is one of the major suggestions to come out of the

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study and the decision will have a very significant impact on the possible contribution of Canadian universities to food-system development over the next decade.

Finally, it is important to encourage Canadian students at the undergraduate level to consider development work when they are planning careers in the private sector, in international and regional research units, and in universities. Universities that have made a serious commitment to food-system development should include at least one course in the undergraduate core curriculum to deal with the international food system and development, and offer an optional course on development concepts, strategies, organization, and approaches appropriate to the food system. Also, CIDA could assist by providing approximately 20 positions annually for undergraduate students for a three- to four-month period of field work on development projects directed by an aid agency, university, NGO, IARC, or a regional research centre. The students would be selected from those specializations needed for development work.

Partnership in Development

The partnership approach between aid agency and developing country is currently recognized by aid agencies, including CIDA and IDRC, as being the most effective. Similarly, it is likely to be most effective between the aid agency and the Canadian university participating in the program or acting as the executing agency.

Major steps were taken toward implementing the partnership approach when LCID was formed in 1977 and when IDO came into operation in 1978. In IDRC Canada has a unique agency concerned with development research and in CIDA an agency concerned with general development programs. The Canadian universities, as they consolidate their approach to international development, should not duplicate the university organization in other countries but rather establish a unique arrangement as a partner with the two Canadian agencies.

IDO should concentrate on working with CIDA, IDRC, NGO groups, and universities and other institutions in developing countries to establish and improve the policies and procedures for university involvement with these agencies as partners in development programs. With this approach, IDO will primarily be concerned with policy development, liaison, and information and will be a facilitating unit for the universities rather than a unit operating development projects. This pattern has been followed by IDO in its first year of operation, and it is strongly recommended that the universities adhere to this policy.

The establishment in 1978 of the internal CIDA-Universities Coordinating Committee to provide a central focus within CIDA for uni-

versity considerations, and the creation of the new Institutional Cooperation Programs unit within the Special Projects Branch, were major steps in creating an effective link within CIDA to the universities. Also in recent years, CIDA has made significant informal moves toward the development of a partnership method of operation, through the sectoral specialists in the Resources Branch. Universities have been identified as the executing agencies at an early stage in the project process and have had an increasing input into the design of the project; in some cases they have participated in the actual feasibility study. Universities so involved are more likely to be interested in participating in the project as the executing agency or as one participant, and are more likely to develop enthusiasm and commitment. If adopted throughout CIDA, this approach would strengthen the food-system project area.

As previously mentioned, faculty and university repeatedly cite difficulties in their involvement in CIDA projects. One problem is that those administering food-system projects do not have sufficient background in the food system. It is recommended that CIDA consider as an urgent matter the rapid implementation of its intention to establish sectoral specialists, including agriculture, fisheries, and rural development specialists, in the area divisions of the Bilateral Branch in order to strengthen the administration of food-system projects. In addition, the number of food-system specialists should be increased and special short courses should be designed to assist the general development officers in becoming more knowledgeable about the food system. CIDA should also consider increasing the number of field officers, assigning food-system specialists as part of the field officer complement in each of the three regional groupings and having them operate from regional offices to supervise the food-system projects and programs throughout the region.

With regard to the problem of rapid turnover of project officers administering a project, CIDA should review its system for project administration with a view to providing greater continuity.

CIDA officers cite problems in working with the universities in some projects, although in most cases these are not food-system projects. Nevertheless, university management of food-system projects could clearly be improved. Any university considering undertaking a project as an executing agency should carefully design a general project management system to ensure efficient administration in Canada and efficient and sensitive management in the field.

The experience of universities over the past 11 years is a valuable resource that has not been fully utilized. IDO could provide a valuable service by organizing a workshop for universities to share their experience in the development of effective management systems for various types of food-system projects. The workshop conclusions, in the form of management models and suggestions, should be

published and distributed widely. IDO should maintain a file on current experience and provide management information upon request to universities.

Building the indigenous research capability of developing countries is essential to the attainment of self-reliance in the food system. This is a tenet of IDRC policy and of most other aid agencies at present. It is unquestionably the basis that should be used for the design of all programs and activities, including research.

Although the scientific capability of the developing countries has been increased substantially in recent years, and is increasing at a significant rate, the fact remains that the absolute capacity is now low and over the next decade will still be low in relation to the food problem. Most of the scientific capacity, and in particular most of the very specialized scientific expertise and equipment, existing in the world today is located in developed countries. An important question is the extent to which this expertise should be utilized to assist developing countries in solving their food problems. At present, it is underutilized. IDRC has involved universities in some very significant research programs, and the arrangements in cases such as post-harvest programs, cassava, triticale, and fish nutrition programs have been in the form of a working partnership. However, the total amount of such research is very modest. Similarly, although some CIDA projects have a research component the total volume of research in CIDA programs is relatively small.

Now that IDRC has a decade of experience in working successfully with institutions in developing countries, it is in a good position to broaden its approach by linking Canadian research units to those institutions in collaborative research programs. If carefully organized and managed, this arrangement will assist IDRC in developing indigenous research capability.

It is recommended that IDRC explore the opportunity of involving Canadian universities in its programs on a large scale in order to increase the volume of development research. The amount of research could be expanded several-fold with existing faculty. If, however, the level of Canadian government aid is raised to 0.6 or 0.7 per cent of GNP, the associated increase in research will require additional scientists in the universities.

With an expanded role, universities could participate in several research fields. Special attention might be given to collaborative research with the IARCs and with faculty in developing countries, which would strenghten their universities' orientation to development. In addition, IDRC should consider providing five postdoctoral awards annually to Canadians to be held at the IARCs, at national or regional research centres, or at overseas universities. This would encourage faculty members to become interested in collaborative development research at an early stage in their careers, would as-

sist in developing long-term associations, and would increase the number of Canadian faculty members experienced in development.

As a consequence of the phase-out of the unit under the senior vice-president in 1979, IDRC does not have a strong structure to develop and coordinate internal policies concerning universities. This deficiency needs immediate attention within IDRC. The urgency is even greater following the announcement by the Canadian government at the 1979 Vienna conference on Science and Technology for Development that substantial additional funds would be made available for new approaches by IDRC involving the Canadian science sector. It is hoped that the government will commit the funds quickly. As IDRC begins to plan this new program activity, it is important that it adopts a partnership approach at the outset by involving the universities at the design stage. It is suggested that each university be invited to respond to the IDRC draft plan and that a workshop be convened by IDRC to provide a forum for a direct exchange between the agency and university faculty experienced in development activities. The universities, in turn, must recognize that the basis for selection of a research project under the new initiative will be its significance to the needs of developing countries rather than its potential contribution to the general advancement of knowledge.

Another aspect of partnership concerns the Canadian universities themselves. There are 48 universities in Canada, each an independent corporation, each with its own special mix of disciplines, its own organizational structure, and its own policies on academic and public service goals. Those working with the university system must understand its diverse nature and not expect all universities to speak with one voice in the manner of a single, large industrial corporation.

There are, however, some situations in which it is advisable and feasible for universities to combine their resources. Success in university cooperation is most likely to occur when there is strong mutual interest and where the operational arrangement is based on equal partnership. Cooperation among universities in carefully selected aspects of development assistance would not only increase the volume and quality of the Canadian effort, but also make the Canadian effort more visible.

Universities mounting the comprehensive type of project, intended to strengthen universities in developing countries on a broad front, have almost always experienced difficulty in finding all of the faculty needed. The same problem exists, although to a lesser degree, in the more specialized projects in university building. Pooling resources would be an advantage.

Furthermore, as overseas universities move through Stages 4 and 5 an increasing portion of the university-building assistance

will centre on the specialized program activities, described earlier in this chapter under Category 1. This type of activity will also be in demand by national research institutions and government units. Some of the special programs can be offered in Canada, but an increasing number should be offered in developing countries under cooperative arrangements with the local university to encourage and support the expansion of its community service role.

Universities are now involved in this special program activity to a modest degree. Examples include a workshop on agricultural teaching methods offered in Canada to personnel from developing countries, a course-workshop program in extension methods offered in St. Lucia for extension personnel, and a background course on food-system development offered in Trinidad for staff of the Caribbean Agricultural Research Institute.

Another important and trend-setting model is a program developed by UNESCO to provide specialized training in specific aspects of veterinary medicine. The plan calls for the identification of a base institution in a developing country and one in an advanced country to collaborate in the program and, on an alternating basis, to provide the site for a short-course. The program covers broad aspects of the topic at the university in the developing country and the more specialized aspects, requiring the input of many specialists and detailed training in special techniques and special equipment, at the university in the advanced country. The plan is underway and the first course, held at a Canadian university, was successful. This kind of partnership between developing countries and Canadian universities should be a model for many such special programs.

Universities could increase their development activities if they planned programs jointly and if they combined their available faculty resources. It is suggested, therefore, that the Association of Faculties and Colleges of Agriculture and Veterinary Medicine consider establishing a consortium to coordinate and expedite their activities in university-building projects, in projects covering special programs of the short-course and workshop type, and in other carefully selected general development projects. This mechanism would also provide a means of associating with university groups in other countries, such as NUFFIC in the Netherlands. NUFFIC has indicated interest in such an association.

The consortium should comprise only those universities that wish to participate in order to ensure commitment and active participation. It should be centred on the faculties and colleges of agriculture and veterinary medicine but be open for participation by home science, social science, and other appropriate units.

The arrangement would require a director and office support to implement the policies established by a committee made up of equal representation from the member institutions. The consortium would

not only respond to requests for participation in projects identified by CIDA, but also take the initiative in identifying project possibilities in partnership with institutions in developing countries. It would approach the aid agencies for financial support for such projects. It would work with IDO in creating and maintaining an inventory of faculty resources and share this information not only with its members but also with the wider community concerned with development projects.

In the special program activity the consortium would develop and compile a series of program offerings and advertise them. The director, assisted by a program planning committee of the participating universities, would work as needed with each university to develop program descriptions, arrange the programs, provide information to prospective clients and direct them to the appropriate participating university. This approach would not result in the establishment of a centre at a single university that would attempt to provide a wide array of programs; rather, it would result in a coordinated offering of a series of programs and activities carried out by the participating universities. The consortium would respond to requests from CIDA and the developing countries. Again, as in the university-building and general development project categories, it would actively seek to identify appropriate activities, and then approach the development agencies for support. One topic that should be considered for major emphasis at present is the role of women in agriculture and rural development.

Another field in which the pooling of resources would be effective is the post-harvest system, which covers activities from harvesting through preservation to family nutrition. A strong university group, with development experience in this post-harvest field, currently exists at the University of Alberta and is working in association with the IDRC post-harvest research staff located there. Laval University, through its Centre for Research in Nutrition, has a formal link with the United Nations University and through this is linked with the Institute of Food Technology in Senegal. (This is Canada's only link with the United Nations University.) A network involving these two Canadian universities, plus additional universities as deemed appropriate, could provide Canada with a unique opportunity for a major international contribution to a vital sector of the food system. It is recommended that IDO and IDRC convene a meeting of the University of Alberta, Laval University, and other universities interested in the post-harvest field to explore the possibility of establishing a network. The network would require a focal point, but the resources needed would be relatively small. IDRC could assist by providing the network coordinator or the funds for this post.

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A third field that might be appropriate for a concentration and pooling of university resources is dryland agriculture bearing on arid and semi-arid regions where a large number of the world's poor are located. Canadian experience has been used very effectively in CIDA dryland development projects in India and Tanzania, with Agriculture Canada as the executing agency. The University of Saskatchewan has a highly successful IDRC research project in new concepts for improving plant productivity under drought conditions. Although there is a centre for development studies for arid areas in the United States, the possibility of a Canadian initiative should be explored. It is suggested that Agriculture Canada, together with the universities in western Canada, CIDA, and IDRC, explore the need for a second centre of concentration of development effort on dryland agriculture and, if a need exists, consider the establishment of a suitable network.

Universities have not participated in fisheries development activities to the same degree as in agriculture and veterinary medicine. This is so even though the IDRC associate director responsible for fisheries in the Agriculture, Food and Nutritional Sciences Division is located at a Canadian university. There is a need for institution-building projects and a need for development research in subjects such as the physiology of reproduction, nutrition, and the utilization of trash fish. In the new circumstances following recent law of the sea negotiations, it appears that Canadian universities may be in a good position to establish jointly a series of courses or special programs on fisheries management.[10] It is suggested that IDO take the lead in organizing a workshop to examine the future role that universities might play in fisheries development activities and to study the need for a coordinating mechanism in the university system. The workshop would include CIDA, IDRC, and universities that now have large fisheries programs.

The social science resources of Canadian universities could be utilized to a greater degree to strengthen the Canadian effort in food-system development cooperation. Development project activities in the food sector generally have drawn heavily on the biological sciences and have emphasized increasing the food supply through increased production and improvement in the post-harvest system. The social science disciplines of agricultural economics, some other components of economics, rural sociology, family studies, and home economics have been utilized to a very modest extent, mainly in support of production. Social scientists have played a vital role in collaboration with biological scientists in assessing needs, ordering priorities, evaluating progress, assessing the environmental impact of new techniques, and in extending the results of research. They have also contributed significantly to planning, organizational, and management studies and projects.

Development activities, undertaken to increase self-sufficiency in food production, must be organized within a framework of rural development and the even broader framework of total development of the country.[11] They must be restricted to technologies that will be compatible with the environment of the particular country to ensure that the new technological base leads to agricultural production and fisheries management systems that are sustainable over time. Above all, the production and management systems and the changes in institutions and life-style inherent in the achievement of increased food production must be compatible with the goals of the people, and the systems selected for introducing the changes in the rural sector must be compatible with the basic social framework of the developing country.

There is a need for a better understanding of food-system development within this broader context of development. Social scientists of many disciplines at Canadian universities have made a substantial contribution to development research. Most have concentrated on basic research. Some have directed their research to the applied and developmental end of the spectrum and have participated in the implementation stages of applied development assistance projects concerned with rural development. Although the survey in this study was not comprehensive, it is evident that a substantial number of Canadian social scientists have experience related to developing countries and are interested in greater participation in development research or in other development activities.

In Canada, some of the university social science research on development is funded by the Social Science and Humanities Research Council of Canada (SSHRC). Research related to the food system directly is funded by Agriculture, Food, and Nutritional Sciences Division of IDRC as part of its project activity. IDRC, through its Social Science Division, also conducts social science research but has not utilized Canadian university faculty to any extent in studies directly related to rural development.

In order to use Canadian university resources more fully, it is suggested that IDO examine with SSHRC and IDRC the possibility of an annual or biennial conference or workshop on social sciences related to development, with one section devoted to the food system. The purpose would be an exchange of views among faculty members and IDRC and CIDA staff. This would assist faculty in identifying the basic and applied needs of concern to IDRC and CIDA and to become fully aware of current IDRC project activities. As a consequence of such discussions, university faculty might choose to direct their SSHRC-funded research to problems identified as important during such sessions. In addition, IDRC, especially its Social Sciences Division, should study the possibilities of increasing the use of social scientists from Canadian universities in IDRC programs.

The most successful CIDA university-building projects in the food system are those for which a Canadian university was the executing agency. Cooperative arrangements of the general type suggested by Walker[12] should be employed by the universities taking part in development projects in the future. Arrangements should be made between the institution in the developing country and the Canadian university under terms satisfactory to both. Such terms must also, of course, be satisfactory to the developing country and to the aid agency concerned. An arrangement based on partnership and mutual interest provides the best insurance for institutional commitment and establishes the basis for a long-term relationship between the two institutions. CIDA and IDO have recently made rapid progress in developing the basis for such arrangements for CIDA projects. CIDA is urged to use this model as soon as possible for projects in both the Special Programs Branch and the Bilateral Branch. In addition, IDRC should consider using such cooperative arrangements for its new programs, in which Canadian institutions expect to participate to an increased extent.

As the new decade begins there is an enthusiasm among faculty members for participation in food-system development activities and there is a realistic understanding of the complexities and demands of international program activities. In addition, during the past year there was evidence of significant improvements in the mechanisms through which the universities work with CIDA, and there appears to be an opportunity for greater participation by universities in new IDRC programs. By adding the modifications suggested in this study to the solid base that exists, an environment would be created for Canadian universities to become a strong partner in development.

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Appendices

Appendix A – Study Methodology

Country List and Groupings

The developing countries considered in this study were those identified by the International Food Policy Research Institute. Two main groups of countries are used – food-deficit and grain exporting.* The food-deficit group, with its three subgroups, includes all countries with food deficits in 1977,† plus those with a considerable risk of a food deficit. The low-income, food-deficit subgroup comprises countries with a per capita average income of less than $300 (US) in 1973, and in which foreign exchange is a constraint. In general, food production levels are low, consumption is already below required dietary levels, and funds to purchase commercial imports are scarce. An increase in agricultural production and fisheries is essential, but assistance is needed to accomplish this and additional food aid will be necessary.

The middle-income subgroup has higher economic growth and food production levels. Production increases are critically needed, and in some cases food aid will still be required. The high-income subgroup has more of the resources needed to supplement food production with imports.

The second group of countries includes those that are grain exporters now, and will continue to be exporters. The list of countries is as follows:

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*International Food Policy Research Institute, *Food Needs of Developing Countries: Projections of Production and Consumption to 1990*, Research Report No. 3 IFPRI, December 1977.

†The system used throughout this report for designating the year, is the year in which the 12-month period ended, i.e., 1976-77 is reported as 1977.

Table A.1 – List of Countries

	Low-Income Food Deficit	Middle-Income Food Deficit	High-Income Food Deficit	Grain Exporters
1. Asia				
	Bangladesh		China, republic of	Pakistan
	Burma		Hong Kong	Thailand
	India		Korea, republic of	
	Indonesia		Malaysia	
	Nepal		Singapore	
	Philippines			
	Sri Lanka			
	Fiji			
2. North Africa/ Middle East				
	Afghanistan	Morocco	Algeria	
	Egypt	Turkey	Iran	
	Sudan	Cyprus	Iraq	
	Yemen PDR	Jordan	Libya	
		Lebanon	Saudi Arabia	
		Syria		
		Tunisia		
3. Sub-Sahara Africa				
	Nigeria	Ghana		
	Sahel	Angola		
	Chad	Ivory Coast		
	Mali	Liberia		
	Niger	Mozambique		
	Senegal	Zimbabwe		
	Upper Volta	Zambia		
	Benin	Swaziland		
	Cameroon			
	Gambia			
	Guinea			
	Sierra Leone			
	Ethiopia			
	Kenya			
	Tanzania			
	Uganda			
	Zaire			
	Burundi			
	Malagasy			
	Malawi			
	Somalia			
4. Latin America				
	Bolivia	Barbados	Venezuela	Argentina
	Haiti	Belize		Surinam
		Brazil		Uruguay
		Chile		
		Colombia		
		Ecuador		
		Mexico		
		Peru		
		Costa Rica		
		Cuba		
		Dominican Republic		
		El Salvador		
		Guatemala		

Low-Income Food Deficit	Middle-Income Food Deficit	High-Income Food Deficit	Grain Exporters
	Guyana		
	Honduras		
	Jamaica		
	Nicaragua		
	Panama		
	Paraguay		
	Trinidad and Tobago		

Student Inventory

The student enrolment data for the country list used in this study were extracted by Statistics Canada from the data base originating from the University Student Information System (USIS).* The numbers in the tables, therefore, are those reported annually by the individual Canadian universities to Statistics Canada.

Starting in 1973, data became available in a standard format; hence these are the earliest data used. It had been planned to present the data for each year to show the trend over a period but this proved unfeasible because of the variation from year to year in the number of students not reporting citizenship status. For example, there were five times as many non-reporting undergraduate students in 1973 as in 1978 and twice as many non-reporting graduate students. Because of this, 1978 data and six-year average data were generally used. In some cases the 1972-73 data were used to obtain an approximate picture of the 1973 situation, but these probably underestimate the number by about 20 per cent.

Other notes that apply to these data and tables are:

1. "Undergraduate others" consists of preliminary year, upgrading year, special auditors, and all others taking undergraduate courses not for the purpose of obtaining a qualification.

2. "Graduate others" consists of Masters qualifying, special auditors at the graduate level, and all others taking graduate courses not for the purpose of obtaining a qualification.

3. Specializations shown in the tables are those used in the USIS system and therefore those for which student enrolment data are available.

It will be noted that the student data are for agriculture and veterinary medicine but not for the other sectors of the food system. The Statistics Canada specialization coding does not have a category for fisheries and aquaculture. Students in these fields are listed with others under one of the biology specializations. Similarly, it was not possible to identify the food-system students in the social

*Statistics Canada. *University Student Information System.* Education, Science and Culture Division, Part I, USIS Input Manual, Part II, Output Manual, mimeo, 15 September 1977.

sciences other than agricultural economics. Because it was important to obtain, if possible, a picture of the number of students in the fisheries and related fields, a request was made personally to the chairmen of biology departments in Canadian universities, at their annual meeting, to provide a summary for the immediate past five years. This request was resoundingly unsuccessful in that only two replies were received. Time did not permit further follow-up.

Project Inventory and Assessment

The main source of the information for the inventory was a questionnaire mailed to the presidents of Canadian universities with a request to distribute it through the deans to each faculty member in departments with activities related to the food system. The questionnaire was discussed with deans of agriculture and veterinary medicine at the annual meeting of the Association of Faculties and Colleges of Agriculture and Veterinary Medicine and with the chairmen of the biology departments of Canadian universities at their annual meeting. The object was to encourage participation by faculty in agriculture, veterinary medicine, and fisheries; the central groups in the food system.

All universities responded, and 33 reported some faculty participation in graduate programs and/or project activities related to the food system. The numbers of respondents by field are shown below.

	Number of Faculty Respondents
Agriculture	338
Veterinary medicine	50
Biology	46
Home science	23
Social sciences	43
Medical sciences	5
Other	28
Total	533

Response was good from the faculties and colleges of agriculture and veterinary medicine, but probably not as good from the biology groups, which cover fisheries. The coverage of sectors other than agriculture, veterinary medicine, and fisheries was undoubtedly spotty, depending on how thorough the university presidents were in arranging for the distribution of the questionnaire and the follow-up, and this certainly varied.

Additional faculty and projects were identified by the respondents in reply to a question asking for a listing of collaborators. A complete list of all faculty advisers and consultants who have taken part in the programs of IDRC since it was formed was supplied by IDRC. Unfortunately, within the period of this study CIDA was not

able to provide a complete listing of all food-system projects involving Canadian universities or a list of faculty members engaged as consultants. Information from all of these sources, and from personal contacts, was collated to produce the inventory.

The inventory cannot be considered a complete listing of all faculty participation and all projects of Canadian universities during the 11-year period because some faculty who participated in development activities in the food system did not complete the questionnaire and, of course, some faculty are now retired and their participation may have been missed. Also the inventory may underestimate the total because it lists only established university faculty. In most of the IDRC research projects scientists have been engaged on a temporary basis to work under the supervision of a faculty member. For each tenth of a person-year of faculty time listed in such projects there will often be one person-year of temporary scientist time involved. Similarly, in many CIDA projects for which the university was the executing agency, and therefore responsible for project management, additional staff were recruited from other agencies to fill the team complement. These non-university staff were not listed in the inventory. Moreover, it is certain that many activities in the social sciences, physical sciences, engineering, and medical fields, and perhaps in others, have been missed. In spite of these omissions, the accumulated inventory is probably an adequate basis for use in estimating the general size and nature of university participation.

It was not possible within the time and resource limits for the study to assess each project in detail. The approach taken was to assess groups of activities to determine how successful the universities were in each kind of activity and to determine, based on accumulated experience, the likely success of each group in the future. Information for the assessment was obtained from several sources: 40 individual interviews with CIDA and IDRC staff; the faculty questionnaire; visits to seven Canadian universities to consult with faculty who had taken part in specific projects; visits to developing countries in relation to 11 projects; participation in Science Council workshops on NGO and private sector participation in food-system development projects; discussions and communication with other individuals and organizations; and previous personal experience.

University Human Resource Inventory

One part of the faculty questionnaire was the human resource questionnaire prepared by the Science Council for distribution to the university, government, and private sectors. Returns from this questionnaire indicate the interest among faculty for future participation in development project activities.

Report Development

A draft report, prepared as a basis for discussion, was considered at a one-day workshop convened by the Science Council of Canada. It was forwarded for comment to all deans of colleges and faculties of agriculture and veterinary medicine and to several other individuals experienced in development activities. In addition, follow-up discussions were held with CIDA and IDRC staff as a final verification of the information on these agencies.

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Appendix B: Canadian University Faculty Involvement in Projects, 1968-78

Region	Project Title*	Sponsor	University	Cooperating Unit in Developing Country	Project Date	Faculty Person-Years	Number of Faculty
Asia/Oceania							
Bangladesh†	Apiculture Development	CUSO	Guelph	Min. of Agri.	1976-78	0.60	1
	Bangladesh – Andsat Project	IDRC	Guelph	Landsat Centre	1977	0.05	1
	General Consultancy to Private Firm	Priv. Firm	York		1976	0.05	1
	*Rumen Bacteria Studies		British Columbia		1975	0.10	1
	Rural and Agricultural Development	CIDA	Guelph	Min. of Agri.	1975	0.15	
Fiji	Establishment of Fisheries Training Project at U. of the South Pacific, Fiji: Project Advice	CIDA	Manitoba	U. of the South Pacific and Fiji Dept. of Fisheries and Fiji College of Agriculture	1971-72	0.20	1
	*Establishment of Fishery Training Project at U. of S. Pacific, Fiji: Project Plan	CIDA	Manitoba	U. of S. Pacific	1975-76	1.00	1
	*Establishment of Fisheries Training Project, U. of S. Pacific, Fiji	CIDA	Victoria British Columbia	U. of S. Pacific	1971-76	3.75	3
	Establishment of Fisheries Training Project at U. of S. Pacific, Fiji: Project Review	CIDA	Toronto	U. of S. Pacific	1976	0.20	1
India	Agricultural Engineering University Facilities	Common Fund	Alberta	University	1972	0.10	1
	Agrometeorology Research Needs for the Semi-Arid Tropics	CESO	Guelph	Federal U. of Paraiba	1978	0.00	1
	Animal Reproduction	India	Calgary	Indian Academy of Science	1978	0.03	1
	*Changes from Subsistence Farming to Intensive Commercial Vegetable Farming in a Himalayan Valley 1959-74	Can. Univ.	Windsor		1971-74	0.41	1
	*Course on Bio-Chemical Eng.	NRC	Waterloo	Indian Inst. Tech.	1977	0.05	1
	Dairy Development in Tamil Nadu	India	British Columbia	Tamil Nadu Agri. U.	1974-75	1.00	1
	Dairy Development Project: Appraisal	CIDA	Guelph	Govt.	1978	0.10	1

	*Development of Standard Ref. Material for the Analysis of Plant Tissue	Can. Univ.	Queen's	G.B. Pant U. of Agri.	1977-78	0.60	1
	Evaluation of Salt Tolerance in Lentils	IDRC	Saskatchewan	Indian Institute of Tech.	1978	0.10	1
	*Field Fertilizer Trial on Improved Sorghum	United Church of Canada	Queen's	Ahmadnagar College	1968-69	2.00	1
	ICRISAT Governor	CGIAR	Alberta	ICRISAT	1972-78	1.05	1
	*Improved Analytical Methods for Trace Metals in Soil	Can. Univ.	Queen's	G.B. Pant Univ. of Agri.	1977-78	0.60	1
	*Plant Phytostrogens		British Columbia		1974	0.10	1
	*Postgraduate Agri. Education and Research	UNDP FAO UNESCO	Guelph	National Dairy Research Inst.	1973-77	0.45	1
	*Problems of Planning: Transportation-Employment-Technological Change in Rural Areas	Ford UNDP	York	Govt. of India	1968-72	2.00	1
	*Project Dev. Officer – Acting Director of ICRISAT	Ford	Alberta	ICRISAT	1972	0.20	1
Indonesia	Aquaculture and Artisanal Fisheries Development in Java	Ford	Dalhousie	Universities Min. of Agri.	1973-75	1.00	1
	*Community and Rural Dev.	CANSAVE	Guelph	Ministries of Agri., Social Affairs and Interior	1970	0.66	2
	Fisheries Evaluation	CIDA	British Columbia	CIDA	1978	0.75	1
	Home Garden Development in Java	Ford	Dalhousie	Padjadpiran U.	1973-75	1.00	1
	*Integrated Resource Management Strategy for Swampland Agri. Dev., Sumatra	Ford	Dalhousie	Universities Min. of Public Works	1973-75	1.00	1
	Pre-Feasibility Study for the Lower Solo River Basin, Java	CIDA Priv. Firm	Guelph Winnipeg York	Min. of Agri. and Water	1978	0.63	4
	Reservoir Fisheries	Ext. Aff. Nat. Geog.	Waterloo	Biotrop Indonesia	1977	0.30	1
	*Rural and Agri. Dev.: Water Resources Dev. Scheme	CIDA	Guelph	Min. of Public Works – Min. of Agr.	1977	0.50	1
	*Rural and Agricultural Development	Men. Cen. Comm.	Guelph	Min. of Agri. and other Ministries	1976	0.50	1

* Projects so designated indicate faculty participation in project implementation; the balance are projects involving professional advice.
† Country or area as designated by respondent.

Region	Project Title*	Sponsor	University	Cooperating Unit in Developing Country	Project Date	Faculty Person-Years	Number of Faculty
Indonesia (con't)	Rural Development Non-Formal Education with Agri. Sector	World Bank	Guelph	Min. of Agri., Edu. and Interior	1973	0.20	1
	Small-Scale Enterprise Project: Craftsmen Involved in Subsistence Farming	World Bank	York	Bank of Indonesia	1978	0.40	2
	Soil Survey in Timot	Priv. Firm	British Columbia	Private Firm	1976	0.20	1
	*Sulawesi Regional Dev. Study	CIDA	British Columbia Alberta Saskatchewan	Min. of Public Works	1973-77	3.42	6
	*Training Mechanism in Resources and Environment	Ford	Dalhousie		1976-77	0.70	1
	Upland Resource Manag. ment and Watershed Rehabilitation	Ford	Dalhousie	Gadjah Mader U.	1976-77	0.70	1
South Korea	Promotion of the use of Canadian Grains and Rapeseed Meal in the Korean Feed Industry	Can. Gr. Coun.	Manitoba	Korean Feed Assoc. and Scout National U.	1972-75	0.13	1
Malaysia	Aquaculture	IDRC	Guelph	Mardi	1976	0.10	1
	*Assistance to Faculty of Veterinary Medicine and Animal Science at Pertanian U.	CIDA	Guelph Saskatchewan	Pertanian U.	1974-78	10.05	4
	*Dev. of Department of Food Sci. and Tech. at the U. of Agri.		Alberta	U. of Agri. Malaysia	1973-75	1.80	1
	Ecological Systems Management For Muda Irrigation Project	Ford	Dalhousie	U. of Penangang	1976-77	0.60	1
	*Economics of the Penang/Kedah Fishing Industries	CIDA Ford	British Columbia	Universiti Sains Malaysia	1971-73	1.10	1
	General Assessment of Veterinary Faculty	Common Fund	Saskatchewan	Pertanian U.	1978	0.07	1
	*Pahang Tenggara Regional Master Plan	CIDA Priv. Firm	Guelph	Economic Planning Unit. Govt. of Malaysia	1970-72	3.18	3
	Regional Dev. Planning for Kelantan, Malaysia	World Bank	British Columbia		1978	1.00	1
	*Training Course in Veterinary Diagnostic Microbiology	CIDA UNESCO	Guelph	Pertanian U.	1978	0.10	1

Nepal	*Project Direction Rural Dev. for Govt. of Nepal	CIDA	Alberta	Govt. of Nepal	1977-78	2.00	1
Pakistan	Agri. Credit Project-Agri. Dev. Bank of Pakistan from the World Bank	World Bank	Manitoba	Agri. Dev. Bank of Pakistan	1977	0.10	1
	Energy Balance Study	Priv. Firm	York		1973	0.10	1
	Grain Storage and Handling Master Plan for Pakistan	CIDA	Manitoba	Govt. of Pakistan	1978	0.40	2
	*Pakistan Grain Storage and Handling – Master Plan Dev.	CIDA Priv. Firm	Manitoba	Min. of Agri. and Food Govt. of Pak.	1978	0.66	2
	*Teaching Graduate Course in Agri. Dev. and Res. on Specific Projects	Ford Pakistan	Simon Fraser	U. of Karachi	1978	1.00	1
Philippines	Agri. Credit Project Philippines	World Bank	Manitoba	Central Bank of Philippines	1976	0.15	1
	Aquaculture Research Facility Development	IDRC	British Columbia		1977	0.10	1
	*S.E. Asian Fish Dev. Centre Aquaculture Dept.	IDRC	Guelph	S.E. Asian Fish Dev. Centre	1976	0.25	1
	*Soil-Crop Interactions in Multiple Cropping Systems	IDRC	British Columbia	IRRI	1974-78	0.40	1
Singapore	Fish Culture – Singapore	IDRC	British Columbia		1978	0.10	1
Sri Lanka	*Apiculture Development	CIDA	Guelph	Min. of Agri.	1976-78	0.30	1
	*Heat Tolerance and Floral Biology of the Bean *Phaseolus vulgaris*	CIDA NRC	British Columbia	Central Agri. Res. Institute	1978	0.20	1
	Major Irrigation Development	CIDA Priv. Firm	British Columbia	Min. of Irrig.	1978	0.20	1
	*Reservoir Fisheries	IDRC	Waterloo	U. of Malaya	1973-74	1.40	1
	*Rural Institutions and Rice Production	Can. Coun.	British Columbia	Agrarian Res. and Training Inst.	1976-77	0.10	1
	*Value Implications of Transfer of United States Rice Science and Technology	Nat. Sci. Foundation	British Columbia Simon Fraser	Agrarian Res. and Training Inst.	1978	0.15	1
Thailand	*Agri. Planning in a Sector Analysis Approach-Agri. Policy Teaching and Res. Direction	USAID	Manitoba	Min. of Agri. and Cooperatives Division of Agri. Economics	1975-76	1.50	1

Region	Project Title*	Sponsor	University	Cooperating Unit in Developing Country	Project Date	Faculty Person-Years	Number of Faculty
Thailand (con't)	*Khon Kaen Univ. Development	CIDA	Manitoba	Khon Kaen U.	1968-71	7.25	5
	*National Inland Fisheries Institute, Thailand	CIDA	Manitoba	Dept. of Fisheries	1971-78	2.20	3
	Proposal for Development of Div. of Agri. and Food Eng. at Asian Institute of Tech.	CIDA Thailand	Alberta	Asian Inst. of Technology	1977	0.10	2
	Swine Management		Alberta	Kesetsart U.	1977	0.13	1
Southeast Asia	*Review of Canadian Development Policy in South Asia	Ext. Aff.	British Columbia		1973-74	0.10	1
	*Fish Nutrition	IDRC	Victoria		1977-78	0.40	1
	Fisheries Res. and Management	IDRC	British Columbia	SEAFDEC	1977	0.20	1
	Reservoir Fisheries		Waterloo	Fisheries Dept. Sri Lanka	1968-78	1.65	1
Far East	Evaluation of Community Dev. Agri. Projects in Bangladesh, India and Pakistan	Men. Cen. Comm.	Manitoba	Mennonite Central Committee Directors in Respective Countries	1974	0.10	1
N. Africa/Mideast							
Algeria	Triticale Development	IDRC	Manitoba	Min. of Agri.	1975	0.05	1
Iran	*Bio Chemical Engg.	BC & BE Res.	Waterloo	Biochemical and Bio-Environmental Res. Centre	1975	0.05	1
Iraq	Advice on Educational Program in Veterinary Faculty	CIDA	Guelph	U. of Iraq	1975	0.10	1
Lebanon	Experimental Station Location Selection	IDRC	Alberta	IDRC	1976	0.02	1
Morocco	Agri. Economics Marketing and Commodity Production Trade	FAO	McGill		1976	0.05	1
	Courses on Food Preservation and Food Science	CIDA	Laval	Min. of Agri. and Agrarian Land Reform and Min. of Cooperatives	1974-77	0.60	1

	*Derro-Tetouan Rural Development Project	CIDA	Quebec	Min. of Interior	1972-73	2.25	3
	Derro-Tetouan Rural Development Project Evaluation	CIDA	Quebec	Min. of Interior	1975	0.10	1
	Evaluation of Development Aid	CIDA	Laval		1975	0.03	1
	Instruction-Soil Fertility	CIDA	Laval		1974-77	0.30	1
	National Soil Survey: Project Evaluation	CIDA	Quebec	Min. of Agri.	1974	0.10	1
	*U. of Meknes – Laval U. Project	CIDA	Laval	U. of Meknes	1973-78	21.85	12
Saudi Arabia	*Water and Agri. Dev. Studies of the Arabian Shield South	Priv. Firm	Guelph	Min. of Water Resources Private Firm	1977-78	0.47	2
Sudan	Assessing Need for Upgraded Transportation System to Move Wheat	CIDA IDRC	Alberta	Mins. of Marketing and Agriculture	1978	0.05	1
	Feasibility Study for Univ. Research Farm – U. of Gezira	CIDA	Alberta Guelph	U. of Gezira	1975-78	0.55	4
	*Sorghum and Millet Improvement Project	UNDP CGIAR	McGill	Min. of Agri.	1977-78	1.50	1
	*Use of Isotopes in Research For Animal Production	IAEA FAO	Alberta		1975	0.10	1
Tunisia	Agri. Economics Training-Res. and Planning		McGill		1974	0.05	1
	Agri. Economics Project Evaluation and Marketing	FAO	McGill		1978	0.05	1
Turkey	Aquaculture in Turkey	IDRC	Toronto	IDRC	1977	0.08	1
	*Conservation of the Mediterranean Monk Seal *Monachus monachus* in Relation to Fisheries Activities	World Wild Fund	Brock	Turkish Min. of Food and Agri. Marine Resources Directorate	1976-78	0.50	1
	*Graduate Course in Agri. Dev.	OECD	Simon Fraser	Middle East Tech. U.	1970	1.00	1
Yemen PDR	Feasibility Study of Equipment For Extension Services	UNDP	Alberta	U.N. Capital Dev. Fund	1978	0.10	1
Middle East	Grain Legumes-ICARDIA	IDRC	Manitoba	ICARDIA	1974-75	0.30	1

Region	Project Title*	Sponsor	University	Cooperating Unit in Developing Country	Project Date	Faculty Person-Years	Number of Faculty
Sub-Sahara Africa							
Burundi	Assessment – Itab Shelter	FAO UNDP	Laval		1976	0.10	1
	Wildlife Conservation Site Selection and Use of Resources	FAO	McGill		1974	0.25	1
Ethiopia	Breeding for Disease Resistance in Coffee	FAO	British Columbia	Ethiopian Coffee Board	1974	0.30	1
	Triticale Development	IDRC	Manitoba	Min. of Agri.	1972	0.05	1
Ghana	*Biochemistry and Food Science Dept., U. of Ghana	CIDA	Guelph	U. of Ghana	1968-70	2.50	1
	Boadi Cattle Prod. Project, Kumasi-Ghana	CIDA	Saskatchewan	Dept. of Agri. and U. of Kumasi	1976	0.07	1
	Feasibility Study – Higher Educ. for Agriculture	CIDA	Guelph	U. of Ghana	1969	0.20	4
	*Guelph-Ghana Project	CIDA	Guelph	U. of Ghana	1970-78	26.46	13
	Maize Project	CIDA	Guelph	Crops Research Institute	1971-76	0.13	2
	Maize Project Training Component	Ghana	Guelph	Ghana	1977-78	0.20	1
	*Poultry Genetics	CIDA	McGill	Govt. of Ghana	1975-78	0.35	1
	*Teaching Irrigation, Drainage and Water Management Courses		Manitoba	U. of Ghana U. of Sci. and Tech.	1968-70	3.00	1
	*University of Science and Technology: Agricultural Engineering and Animal Science	CIDA	Alberta Manitoba Nova Scotia Agri.	Ghana Council of Higher Education and U. of Sci. and Tech. – Kumasi	1968-76	8.65	4
	*Utilization of Cassava in Poultry Diets		Guelph	U. of Ghana	1968-78	0.77	1
Guinea	Apiculture Development	SIDA	Guelph	Min. of Agri.	1977-78	0.20	1
Kenya	*Animal Health Education Veterinary Faculty, U. of Nairobi	CIDA	Guelph	U. of Nairobi	1975	0.75	1
	*Apiculture Development	CIDA	Guelph Manitoba	Min. of Agri.	1971-78	2.62	3
	*Assistant Director of Veterinary Services (Research)	ODM	Guelph	Min. of Agri.	1971-73	2.00	1

Baringo Catchment Appraisal	FAO	Alberta	Min. of Agri.	1978	0.02	1
*Dairy Cattle Nutrition	CIDA	British Columbia		1977	0.05	1
*Decentralization of Rural Planning	CIDA	York	Min. of Finance and Planning	1975	0.20	2
Dev. of School of Environmental Studies, U. of Nairobi	Priv. Firm	York	U. of Nairobi	1977	0.10	1
*DFKZ-Kenya Project – Govt. of Switzerland		Manitoba	Dept. of Food Sci. and Tech. U. of Nairobi	1975-76	1.16	1
*Establishment of Project Planning and Evaluation Unit	CIDA	York	Min. of Finance and Planning	1970-77	5.50	2
*Evaluation of the Operations and Structure of the Maize and Produce Board	CIDA	York	Min. of Finance and Planning Maize and Produce Board	1973-74	0.30	1
*Growth Centres and Rural Dev.	IDRC	Carleton	U. of Nairobi	1972-73	1.00	1
*Intensive Course on Improving University Teaching and Learning in Agriculture	GTZ	Cape Breton	U. of Nairobi	1977	0.12	1
*Marketing of Food in Nairobi	Common Fund	Alberta	U. of Nairobi	1977-78	0.12	1
Njoro Res. Station: Project Feasibility	CIDA	Manitoba	Njoro Res. Station	1968	0.05	1
*Njoro Research Station	CIDA	Manitoba	Min. of Agri. and Kenya Wheat Board	1968-75	8.00	4
*Pastoral Farmers Training Centres	CIDA	Saskatchewan	Min. of Agri.	1976	0.10	1
*Radio Isotopes in Agri.	IAEA	Guelph	National Agri. Lab Ministry of Agri.	1974-76	1.40	1
*Rural Development in Moranga	Can. Coun.	Carleton		1969	0.30	1
*Rural Non-Farm Sector in Central Province, Kenya	CIDA	York	Min. of Planning	1976-78	1.60	2
*Seminar on Isotope Hydrology	IAEA UNESCO	Waterloo		1978	0.05	1
*Speciality Teaching at U. of Nairobi	CIDA	Saskatchewan	U. of Nairobi	1976	0.30	2
The Use of Radioisotopes in Agri.	IAEA	Guelph	National Agri. Lab Min. of Agri.	1975	0.10	1
Triticale Development	IDRC	Manitoba	Min. of Agri.	1971	0.05	1
*Trypanosomiasis – East Africa	IDRC	Guelph Saskatchewan	Kenya Department of Agri. EAVRO EATRO	1974-78	11.70	5

Region	Project Title*	Sponsor	University	Cooperating Unit in Developing Country	Project Date	Faculty Person-Years	Number of Faculty
Kenya (con't)	Trypanosomiasis – East Africa: Experimental Design and Data Handling	IDRC	Guelph	Kenya Min. of Agri., EAVRO	1977-78	0.30	1
	Trypanosomiasis: Advice to IDRC	IDRC	Guelph		1971	0.10	1
	*Wildlife Diseases – Kenya	IDRC	Guelph		1975-77	3.00	1
Malawi	*Professor Bunda Agri. College Lilongwe	CIDA	Saskatchewan	Bunda Agri. Coll. Lilongwe, Malawi	1972-73	0.70	1
Mali	Cost of Maintaining the Niger Office for Rice Production in Mali	CIDA	Montreal	Inter-State Committee Combating Drought in the Sahel Countries	1978	0.20	1
Niger	Grain Marketing and Storage	Priv. Firm	York		1975	0.10	1
Nigeria	*Abrasive and Attrition Milling of Grains and Grain Legumes	IDRC	Guelph	IDRC	1971-72	0.35	3
	*Animal Waste Feeding Trials	CIDA	British Columbia		1976	0.05	1
	*Composite Flour Project	IDRC	Manitoba	IDRC	1971-74	0.40	1
	*Course on Microbiological and Biochemical Technology	UNESCO	Waterloo	U. of Nigeria Lagos	1978	0.02	1
	*Developing Small Mill for Local Cereals in Nigeria	IDRC	Alberta	Min. of Agri. and Cooperatives – Fed. and State	1974-77	0.20	1
	Developing Small Mill for Local Cereals in Northern Nigeria	IDRC	Alberta	Min. of Agri. and Cooperatives	1974-77	0.20	1
	Development of Irrigation and Agri. Eng. Technology in the Koduna Polytechnic School	CIDA	Manitoba	Koduna Polytech. School	1973	0.35	2
	*Ergonomics in Agri. Implement Design and Usage	CIDA	Waterloo	Faculty of Tech. U. of Nigeria	1977-78	0.30	1
	*Food Legume Utilization	IDRC	Saskatchewan	Min. of Agri.	1973-76	3.55	2
	General Agri. Reorganization Project for Mid-Western State of Nigeria	CIDA	McGill		1975	0.05	1
	Grain Milling Technology for Sorghum and Millet	IDRC	Alberta	Min. of Agri.	1974-78	0.40	1

	Grain Milling – Nigeria	IDRC	Alberta	Min. of Agri.	1978	0.10	1
	Interdisciplinary Workshop on Consumer Food Utilization in Semi-Arid Tropics in Africa	IDRC	Laval	Ahmadu Bello U. Inst. for Agri.	1973	0.14	2
	Liaison Between OVC and Vet. Faculty, U. of Ibadan	CIDA	Guelph	U. of Ibadan	1968	0.10	1
	*Organization and Participation in Workshop on Remote Sensing for National and Regional Planning	CIDA UNESCO IGU	McMaster	The International Geographical Union	1978	0.15	1
	Pre-Feasibility Study for the Deep River Project	CIDA Priv. Firm	Guelph	Min. of Agri.	1975	0.77	2
	Soil Fertility and Plant Nutrition on Acid Tropical Soil	IDRC	Guelph	IITA	1976	0.10	1
	*Studies on African Cassava Mosaic	IDRC	McGill	IITA CIAT	1973-76	1.40	1
	Undergraduate Curriculum	Nigeria	McGill	U. of Nigeria	1975-76	0.09	1
	*U. of Nigeria Faculty of Agriculture	CIDA	Alberta Saskatchewan	Faculty of Agri. U. of Nigeria	1972-74	2.50	3
Rwanda	Faculty of Agriculture: Economic Feasibility	CIDA	Laval		1975	0.30	3
	Irrigation System	CIDA	McGill	Min. of Agri.	1976	0.10	1
	Role of External Aid in Agri. and Economic Development	CIDA	Laval		1976	0.10	1
Senegal	*Drought-Resistance of Sorghum Cultivars	IDRC	Laval	National Agri. Res. Centre, Bambey	1972	0.10	1
	*Graduate Training for Students from Sahel Countries	IDRC	Laval	National Agri. Res. Centre Bambey	1975-77	0.30	1
	Post Harvest Res. Data Analysis Systems	IDRC	McGill	IDRC	1978	0.05	1
	Sorghum Program Planning – Senegal	IDRC	Laval	National Agri. Res. Centre, Bambey	1972	0.08	1
Sierra Leone	Tropical Pulse Management	CIDA	Saskatchewan	Njala U.	1978	0.10	1
Swaziland	Dairy Dev. Feasibility Study	CIDA	Saskatchewan	Min. of Agri.	1975	0.80	5
	*Dairy Development Scheme	CIDA	Saskatchewan	Min. of Agri.	1975-78	0.60	1

Region	Project Title*	Sponsor	University	Cooperating Unit in Developing Country	Project Date	Faculty Person-Years	Number of Faculty
Tanzania	Feasibility Study on Wheat Production in Tanzania	CIDA	Saskatchewan	Min. of Agri.	1968	0.20	1
	*Land Capability and Land Tenure: Problems and Prospects for Agric. Dev. in the North Mkata Plain, Tanzania		Laurentian	U. of Dar Es Salaam	1970-71	1.60	1
	Rukwa Region Remote Sensing Project	IDRC	Laurentian	U. of Dar Es Salaam	1975-78	0.55	1
	*Studies on Phycocolloids of Certain African Seaweeds		McMaster		1978	0.05	1
	Tanzania Wheat Project – Dev. of Training Program	CIDA	Saskatchewan	Min. of Agri.	1977-78	0.10	1
	*Tanzanian Soils and Soil Surveys: A Text and Critical Review		Laurentian		1976-78	0.30	1
	*Wheat Production in Tanzania	CIDA	Saskatchewan	Min. of Agri.	1972-74	2.00	1
Uganda	*Assistance to Animal Science Dept. at Makerere U.	CIDA	Saskatchewan Nova Scotia Agri.	Makerere U.	1968-72	3.70	4
	Feasibility Study for Estab. of Veterinary College at Makerere U.	CIDA	Saskatchewan	Makerere U.	1972	0.30	3
	Identify Professionals Needed for a Project Development Team	CIDA	Alberta	Min. of Agri.	1971	0.10	1
	Technical Assistance for the Planning Unit of the Ministry of Agriculture	CIDA	Guelph	Min. of Agri.	1970	0.20	1
Upper Volta	Rat control	CIDA	McGill		1974	0.10	1
	*Wildlife Cropping		British Columbia	Min. of Natural Resources	1975-78	0.10	1
Zaire	*Technology Transfer in Several Manufacturing Industries including Food Processing	IDRC	Concordia		1975-77	2.50	1

Zambia*	Rain-Fed Wheat Production: Project Review	CIDA	Guelph	Min. of Agri.	1977	0.15	1
	Rain-Fed Wheat Production: CIDA Advisory Committee	CIDA	Saskatchewan	Min. of Agri.	1976-78	0.30	1
	*Rural Development Officer for Govt. of Zambia	CIDA	Alberta	Govt. of Zambia	1974-75	2.00	1
	Soybean Project	CIDA	Guelph	Comm. Farmers Association of Zambia	1972	0.10	1
	Zambia-Manitoba Faculty of Agri. Project: Feasibility Study	CIDA	Manitoba	U. of Zambia	1978	0.15	3
	*Zambia-Manitoba Faculty of Agri. Project	CIDA	Manitoba	U. of Zambia	1978	0.25	1
West Africa	Development of Coastal Village Fisheries in W. Africa	IDRC	Memorial Dalhousie	Min. of Agri.	1971	0.40	2
	*FAO Centre for Dairy Technology	FAO DANIDA	Laval	Min. of Agri.	1972-73	1.40	1
	GASAGA Priorities Paper on Cereal Post-Harvest Loss Redn.	IDRC	Alberta	IDRC	1977-78	0.50	1
	*Hydrometeorological Survey of Upper Nile Basin	WHO	McGill		1976-77	1.00	1
	Post Harvest Systems Res. and Dev. in Sahelian Africa	IDRC	Alberta	Govt. Ministries Res. Institutes	1977	0.20	
	Post-Harvest Food Grain Industry in Semi-Arid Africa Study Team	IDRC	Manitoba	IDRC	1974	0.15	1
	Promoting Cooperative R & D in Post-Production Activity	IDRC	Alberta	Min. of Agri. Universities Res. Stations	1975	0.10	2
Africa	*Control of Tsetse Flies by the Sterile Male Technique	IAEA	York	IAEA	1968-78	1.10	1
	Dairy Development Project, Lesotho	CIDA	Saskatchewan	Min. of Agri.	1974	0.10	
	Feasibility Study for a World Bank Loan	World Bank	McGill		1973	0.05	1
	*Impact of Slash and Burn Practices on Long-Term Productivity		Queen's		1977-78	0.40	1
	Soil Research Priorities	IDRC	Manitoba		1975	0.15	1
	Tsetse Eradication or Control	IAEA	Alberta Toronto		1974-78	0.18	1

Region	Project Title*	Sponsor	University	Cooperating Unit in Developing Country	Project Date	Faculty Person-Years	Number of Faculty
Latin America							
Argentina	*Evaluation of Fish Resources of the Argentinian Continental Shelf	FAO UNESCO	St. Mary's	Dept. of Fisheries	1968-70	2.00	1
Barbados	*Animal Health Diagnosis and Training	WHO	Guelph	Min. of Agri.	1975	0.20	1
	CIDA-Barbados Comfith Project	Priv. Firm CIDA	McGill	Private Firm Min. of Agri.	1969-74	1.03	5
	Mathematical Model for Agri. Sector of Nation's Economy	IDRC	Alberta	Min. of Agri.	1972-73	0.15	1
	The Field Performance of a Windmill-Powered Irrigation System	Can. Univ.	McGill	Min. of Agri.	1968	0.20	2
Belize	*Agro-Climate Model for Subsistance Farming	Can. Univ.	Wilfred Laurier		1978	0.20	1
	*Agro-Productivity of Selected Mennonite Colonies	Can. Univ.	Wilfred Laurier		1974-75	0.40	1
	*Development of Extension Services	FAO	Alberta	Dept. of Agri.	1968	1.00	1
	*Milpa Agriculture in Recently Cleared Jungle and Its Effect On the Nutrient Status of the Soil	CIDA	Carleton	Min. of Agri.	1977-78	1.00	1
	Survey of Weed Communities in Areas of Peasant Agriculture	Can. Univ.	York	Belize Agri. Dept.	1968	0.30	1
	Survey of Weed Populations in Belize	Can. Univ.	York	Belize Agri. Dept.	1972	0.50	1
Brazil	Agri. Colonization Survey	Brazil	Calgary	Brazilian Inst. of Geography and Statistics	1974	0.10	1
	Animal Production	Alta. Gov.	Calgary	Private Firm	1975-78	0.40	1
	*Application of Nuclear Tech. in Agriculture-Nitrogen Fixation in Sugarcane	IAEA	Dalhousie	Centre for Nuclear Energy for Agri. (CENA)	1978	0.13	1

*Course on Bio-Chemical Eng.	NRC	Waterloo	U. of Sao Paulo and Rio de Janeiro	1971	0.25	1
Dairy Dev. Tech. Exchange	ITC Can.	Guelph	Min. of Agri.	1978	0.10	1
*Dairy Development Technical Exchange	Priv. Firm	Saskatchewan	Min. of Agri.	1978	0.10	1
*Food Habits and Nutritional Status of BOIA-FRIA Migrant Workers of Brazil and Growth and Dev. of their Children	Brazil	British Columbia	U. of Sao Paulo Medical School	1977	1.00	1
International Program for Res. and Training in Nitrogen Fixation in the Tropics	NRC	McGill	NRC	1974-77	0.50	1
*International Program for Cooperation in Training and Res. in Nitrogen Fixation in the Tropics		Dalhousie McGill	Embrapa-Brazil	1977-78	0.52	2
Methods of Controlling Temp. of Stored Grain in Brazil		Manitoba	Fund Acao de Ampo a Pesquisa do Estadode Saopaulo	1977-78	0.15	1
Post-Graduate Program in Agrometeorology and Research on Water		Guelph	ICRISAT	1978	0.03	1
*Reproduction in Farm Animals	CESO	Guelph	Universities Govt. and Private Firms	1974-78	2.20	1
Rural Development	Brazil	Calgary	State Dev. Agency	1973	0.10	1
Rural Development Plan for 1974-78	Brazil	Calgary	Brazilian Inst. of Geography and Statistics	1974	0.50	1
*Seminar Series on Cattle Production	Hols. Fri. Ass. ITC Can.	Guelph	Min. of Agri.	1978	0.10	1
*Sorghum and Millet Res. and Dev. Program for North-East Brazil	Ford	McGill	Secretary of Agri. Federal U. of Kara Federal U. of Pernambuco	1972-77	5.50	1
*Strengthening Soil Research and Teaching at Federal U. of Pernambuco and Federal Rural U. of Pernambuco	CIDA	Saskatchewan	Federal U. of Pernambuco and Federal Rural U. of Pernambuco	1976-78	1.03	4

Region	Project Title*	Sponsor	University	Cooperating Unit in Developing Country	Project Date	Faculty Person-Years	Number of Faculty
Brazil (con't)	*Technical Support to the Faculty of Food and Agri. Eng. – U. of Campinas	CIDA	Guelph	U. of Campinas	1977-78	0.15	1
	*Water Supplies and Causes of Salinisation in N.E. Brazil	UNDP IAEA	Waterloo	Cena Piracicaba	1975-76	0.30	1
Chile	*Fresh Water Supplies in North Chile	UNDP IAEA	Waterloo	CCHEN Santiago	1976-77	0.20	1
	Triticale Development	IDRC	Manitoba	Min. of Agri.	1974	0.05	1
Colombia	Advice to CIAT on Soil Project	CIDA	McGill	CIAT	1973	0.03	1
	*Cassava Breeding and Genetics	CIDA IDRC	Guelph	CIAT	1972	0.50	1
	*Cassava Chemotaxonomy Classification	IDRC CIDA	McGill	CIAT	1972-74	0.45	1
	*Cassava Micronutrient Study	CIDA IDRC	Guelph	CIAT	1974-75	0.20	1
	*Cassava Mosaic	IDRC CIDA	McGill	CIAT	1972-74	0.45	1
	Cassava Program Advising Committee	IDRC CIDA	McGill Guelph	IDRC	1970-74	0.50	2
	*Cyanogenic Glucosides in Cassava	CIDA IDRC	Guelph	CIAT	1972-73	0.15	1
	*Dietary Significance and Metabolism of Linamarin	CIDA IDRC	Guelph	CIAT	1972-78	1.00	2
	*Enrichment of Cassava with Microbial Protein	CIDA IDRC	Guelph	CIAT	1972-78	2.71	7
	*Establish an Agricultural Communication Centre	CIDA	Saskatchewan	ICA Dept. of Agri.	1972-74	2.00	1
	*Exploratory Res. on Cassava	CIDA IDRC	Guelph	CIAT	1970	0.20	1
	*Factors Affecting Farmer Choice of Rice Variety	CGIAR	Guelph	CIAT ICA INCORA	1976	0.20	1
	*Growth Physiology of Cassava	CIDA IDRC	Guelph	CIAT	1973-76	1.30	1
	*Tropical Legume Breeding Project	IDRC	Alberta	Min. of Agri.	1971-73	0.30	1

Costa Rica	Govt. Aquaculture	Costa Rica	Guelph	Min. of Aqua. and Fisheries	1978	0.03	1
Cuba	Advice on Dairy Cattle Breeding and on Training Students in Canada		Guelph	Govt.	1974	0.05	1
	Advice on Poultry Nutrition and Feed Formula	CIDA	Guelph	Min. of Agri.	1978	0.06	1
	Advisor to Cuban Inst. of Animal Science	CUSO IDRC	McGill	Cuban Govt.	1972-73	1.10	1
	*Artificial Insemination	CIDA	McGill	INRA	1976-78	0.35	1
	*Conversion of Agricultural Waste Into Animal Feed	Cuba	Waterloo	Cuban Inst. for Investigation of Sugar Cane Derivatives and By-Products	1977-78	0.15	1
	CUJAE (CUSO-CIDA) Agr. Eng. Feasibility Study	CIDA	Saskatchewan	U. of Havana	1975	0.10	1
	*CUJAE-Cuba Agri. Engineering	CIDA CUSO	Saskatchewan Alberta	U. of Havana	1975	0.40	4
	*Livestock Feeding Seminars	Can. Wh. Brd.	Manitoba		1976	0.10	1
	*Livestock Feeding Seminars	Can. Gr. Coun.	Manitoba		1977	0.10	1
	*Poultry Joint Working Group	CUSO	McGill	Govt. of Cuba	1978	0.05	1
	Program in Bio-Chemical Eng.	CUSO	Waterloo	U. of Havana	1973	0.05	1
	Reproductive Studies of Domestic Animals	CUSO	Saskatchewan		1973-75	1.80	2
	Swine Production	CUSO	British Columbia	Min. of Agri.	1976-78	0.04	1
	*Swine Production	CUSO	Guelph	Min. of Agri.	1978	0.03	1
Dom. Republic	*Nutrition Training Project: Child Nutrition	CIDA	Mt. St. Vincent	Hospital – Nuestra Senora de Regla-Caritas Dominican	1978	1.00	1
	*Social Factors Affecting Banana Production	ODM	Mount Allison		1972-73	1.20	1
Ecuador	Guayas Basin Development	CIDA Priv. Firm	Alberta	Min. of Planning	1972	0.10	1
	Productivity of Agri. Systems	Can. Coun.	McMaster	Min. of Agri.	1971	0.20	1
	Soil Degradation in Areas of Tropical Agricultural Colonization	NRC	McMaster	Min. of Agri.	1972	0.30	1

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Ecuador (con't)	Value of Aquaculture on the High Plateau in the Andean Region	CIDA	Montreal	Nat. Fisheries Institute	1975-76	0.70	4
El Salvador	Description of Studies Needed for the Dev. of Aquaculture in El Salvador	CIDA	Montreal	Min. of Agri.	1976	0.20	2
	*Eco-Development in El Salvador	CIDA	York		1978	0.10	1
	*Establishment of Montecristo National Park	El Salvador	York	Min. of Agri. Conservation Foundation	1971	0.10	1
	*Man-Induced Ecological Change in El Salvador		York		1968-69	0.60	1
	*Political Economy and the Processes of Class Formation Among Banana Producers	Can. Univ.	York	Facuhad Latino Americana Degenaas Sociales Sede Quito	1976-78	0.90	1
Guatemala	*Workshop on Fermentation and Enzyme Technology	OAS	Waterloo		1974	0.05	1
Guyana	Factors Influencing Recovery Time of Infants Suffering from Malnutrition	CIDA	Manitoba	National Science Res. Council	1978	0.01	1
	*Political Economy of Rice Production Among East Indians	Can. Coun.	York	U. of Guyana	1969-77	2.50	1
	Socio-Economic Factors Affecting the Success of a Nutritional Weaning Food	Guyana	Manitoba	Govt. of Guyana	1978	0.05	1
Haiti	*FAMV-Faculty of Agri. and Veterinary Sci.	CIDA	Laval	U. of Haiti	1976-78	3.80	4
	FAMV-Faculty of Agri. and Vet. Sci. Feasibility Study	CIDA	Laval	U. of Haiti	1972	0.10	1
	*Impact of Irrigation Project on Fisheries of Mirogoine Lake	CIDA	McGill		1978	0.10	1
	Integrated Rural Dev. Project: Rat Control	CIDA	McGill		1976-77	0.20	1

	Integrated Rural Dev. Project: Feasibility Study	CIDA	Laval	Min. of Agri.	1972	0.10	1
	Integrated Rural Dev. Project: Planning Advice	CIDA	Laval	Min. of Agri.	1977	0.05	1
Honduras	Recommendations for Improving The Agri. Marketing System	IDRC Priv. Firm	Guelph Manitoba	Min. of Agri.	1974	0.20	2
Jamaica	*Bovine Fertility Project	CIDA	Guelph	Min. of Agri.	1977-78	0.23	1
	*Feasibility of Clavendon Plain Irrigation Project (Phase 3)	CIDA Priv. Firm	York	Min. of Agri. and Lands	1978	0.20	2
	*Industry-Agriculture Relations	Can. Coun.	York	Sev. Ministries	1968	0.50	1
	Reasons for Infertility in Local Cattle	CIDA	Guelph	Min. of Agri.	1977-78	0.10	1
	*Sugar-cane transport	CIDA	Guelph	Sugar Industry Research Inst.	1976-78	0.25	1
Mexico	*Agrarian Elites in Central Mexico and Transformation of Maguey-Producing Regions to Barley Production	Can. Univ.	York		1968-73	0.55	1
	*Course on Fermentation Technology	DME Country	Waterloo	Polytechnic Inst.	1976	0.05	1
	Curriculum Development for Integrated Rural Development	FAO	Guelph	Agrarian U., Cuahuila	1975	0.40	1
	Dairy Cattle Research Program for the National Univ. – Mexico		Guelph	National U. of Mexico	1972	0.20	1
	Graduate Program for Training Agents for Integrated Rural Development	Rockefel. Ford	Guelph	National Agri. Graduate College Chapingo	1977	0.05	1
	*Measurement of Peasant Attitudes to Modernization of Traditional Agriculture		Simon Fraser	Minde Recursor Hidraulicos	1970	0.30	1
	Mexican Fruit and Vegetable Industry	Priv. Firm	York		1976	0.05	1
	*Mobilization of Peasant Unions in Land Reform Programs		York		1968-77	0.35	1
	Pasture Res. Program for North Mexico	IDRC	Alberta		1975-76	0.40	1
	Recruitment of Maya Peasants for Irrigation Projects		Simon Fraser	Minde Recursos Hidraulicos	1975	0.10	1

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Mexico (con't)	Review National Forage Res. Program	IDRC	Alberta	Min. of Agri.	1974	0.20	1
	Seminar on Cattle Breeding		Guelph	Govt.	1975	0.05	1
	Triticale Development	IDRC	Manitoba	CIMMYT	1976	0.10	1
	*Urban Food Supply Problems	Ford	York		1968	0.10	1
Nicaragua	*Cultural Ecology of the Miskito Indians		York	Banco Centrale de Nicaragua	1978	0.10	1
Paraguay	Evaluation of 25-Year Program of Experimentation and Extention in Mennonite Colonies in Chaco of Paraguay	Men. Cen. Comm.	Manitoba	Association of Mennonite Colonies of Chaco	1972	0.10	1
	*Regional Dev. Analysis – The Impact of a New Road on Agricultural Economy	Can. Univ.	Wilfred Laurier		1973	0.25	1
Peru	Cultivation of Rapeseed and Cereals in the Alteplano	CIDA	Alberta Saskatchewan	Min. of Agri.	1976-78	0.32	2
	*Initiate and Develop a Graduate Program in Agri. Eng.	FAO	Manitoba	UNDP IICA FAO	1968-70	3.00	1
	Pasture Legumes Peru	IDRC	McGill	Govt. Ministry	1976-78	0.08	1
	*Peruvian-Canadian Cooperative Study of the Peruvian Anchovy Fishery	CIDA	Dalhousie Guelph	Instituto Del Mar of Peruvian Min. of Fisheries	1976-77	0.75	1
	Review and Implementation Plan for a Proposal to Use Remote Sensing to Study Natural Resources	CIDA Can. C. Rem. Sens.	McMaster	National Office for Natural Resource Evaluation	1974-75	0.32	1
	*Selection and Seeding of Early Maturing Wheat and Barley for Germplasm Assessment on the Alteplano, Peru	CIDA IDRC	Alberta		1977	0.20	2
	*Use of Isotopes in Res. for Animal Production	IAEA FAO	Alberta		1977	0.10	1
Trinidad and Tobago	*Food System Dev. Course in the Caribbean Community	CIDA World Bank	McGill	Caribbean Agri. Res. Inst.	1977	0.40	1

	Reduction of Energy and Chemical Fertilizer Inputs to Food Production		McGill	Min. of Agri.	1977	0.10	1
	U. of West Indies Agri. Eng. Feasibility Study	CIDA	Guelph Manitoba	U. of the West Indies	1974-78	0.52	4
	*U. of the West Indies - McGill U. Sugarcane Feed Centre	CIDA	McGill	U. of the West Indies, Govt. of Trinidad and Tobago	1975-78	3.02	6
Venezuela	*Agro-Capability of Tropical Alluvial Levees	Can. Univ.	Wilfred Laurier		1976-77	0.40	1
	Integrated Development Project Assessment		Simon Fraser		1978	0.05	1
Caribbean	Advice on Dev. of a Training Course for Extension Workers and Advising on Agri. in the School Program	CIDA Rot. Club	Guelph	Govt. of St. Lucia and Rotary Clubs of Guelph and St. Lucia	1978	0.10	1
	Assessment of Water Resources For Humans, Animals and Irrigation	Can. Univ.	McGill	Min. of Agri.	1977	0.10	1
	*Development of Banana Industry	ODM	Calgary	Min. of Agri..	1968	0.50	1
	*Development of Small-Scale Agriculture	ODM	Calgary	Min. of Agri.	1968	0.50	1
	Establishing Barley Trade	Can. Gr. Coun.	Saskatchewan	Trade Ministry	1969	0.10	1
	Evaluation of Aid Programs Relative to Community Agri.	CIDA CANSAVE	West Ontario		1968-78	0.40	1
	Evaluation of Derinded Sugarcane as Livestock Feed	Priv. Firm CIDA	McGill	Min. of Agri. St. Kitts	1968	0.10	5
	Evaluation of Soil Testing Needs in St. Lucia	CIDA	McGill	Private Firm	1977-78	0.05	1
	*Impact of Tourism on Domestic Agri. and Food Supply: St. Lucia	ODM	Calgary	Min. of Agri.	1971	0.20	1
	*Impact of Tourism on Domestic Agri. and Food Supply: Montserrat	ODM	Calgary	Min. of Agri.	1973	0.20	1
	*Industrial Fermentation	CIDA	British Columbia	Caribbean Industrial Res. Institute	1975-76	1.00	1
	Marine Science Development in Nevis		British Columbia	National Academy Science	1976	0.20	1

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Caribbean (con't)	Pigeon Pea Improvement	IDRC	Saskatchewan	U. West Indies	1971	0.08	1
	*Training Course for Extension Workers in St. Lucia	CIDA Rot. Club	Guelph	Govt. of St. Lucia and Rotary Clubs of Guelph and St. Lucia	1978	0.20	2
	*Problems of Planning-Transportation-Employment-Technological Change in Rural Areas	World Bank	York	Universities Res. Institutes and Govt.	1973-77	2.50	1
Latin America	*Agri. Planning and Development	CIDA	Manitoba	United Nations Latin American Inst. for Social and Economic Planning	1972-73	1.90	1
	Evaluation of Swine Program at CIAT	IDRC	Alberta	CIAT	1975	0.06	1
	Home Economics-Latin America	IDRC	Guelph		1977-78	0.20	1
	Planning and Evaluation Procedure for Program Designed to Improve Quality of Life on Household Level of Rural Popn.	IDRC	Guelph	Alader. Min. of Agri. of Venezuela and Mexico U. of S. Paulo	1977-78	0.20	1
	Rapeseed Meal Utilization	R. Seed Can.	Alberta	Min. of Agri.	1976	0.06	1
	*Seminars and Discussions on Remote Sensing Applications in Three Countries	Can.C.Rem. Sens. PAIGH	McMaster	Pan American Inst. of Geography and History (PAIGH)	1977	0.10	1
	*The Beef Cattle Industry of Central America – Panama		Lethbridge		1972	1.00	1
Global	*Administration of CUSO Prog. for Management of Agriculture	CUSO	Guelph	Govt. Ministries	1968-69	1.50	1
	*Dev. Cooperative Post-Prod. Program Between the Five Asian Countries and Four Donors	IDRC CGIAR	Alberta	Marketing Agency – Agriculture and Cooperatives	1975-76	0.80	1
	*Development of Veterinary Pathology Diagnostic Laboratory	CIDA	Manitoba	Dept. of Agri. Livestock Branch Veterinary Serv.	1975-77	2.30	1
	Development of an International Monitoring System for Soil Deterioration		Toronto		1977-78	0.10	1

*Economics of Cassava Prod. Systems – World Supply and Demand	CIDA IDRC	Guelph	CIAT	1973-78	3.00	1
Efficiency in the Use and Reuse of Water		Laurentian		1977	0.10	1
Emergency Financing of Foreign Students in Canada	CIDA	Guelph	CIDA	1974	0.10	1
FAO/WHO Expert Committees on Nutrient Requirements and on Food and Nutrition Intervention Planning	WHO	Toronto		1974-76	0.15	1
Fisheries Research Planning	USAID Priv. Firm	Simon Fraser	Govt. Departments, Universities, International Agencies	1977-78	0.08	1
Fishery Utilisation	Don Can Found.	British Columbia				
General Advice on Projects, Training, Program Evaluation, Budget	CIDA CANSAVE CBIE	Guelph		1975-78 1978	2.00 0.20	1 1
*Hand Water Pumps for Irrigation	IDRC	Waterloo		1976-77	0.24	3
Learning Needs of Rural Youth	UNESCO	Alberta	International Inst. for Educational Planning	1977	0.25	1
Members of IDRC Board of Governors	IDRC	Alberta Guelph		1970-75	0.80	1
*Orientation of CUSO Workers	CUSO	Guelph				
PhD Award Panel	IDRC	Guelph		1968	0.10	1
Planning Committee for Design of Major US Aid Program of Nutrition Res. in Dev. Countries	USAID	Toronto		1977-78 1974-76	0.20 0.15	1 1
Planning Committee for WHO Program of Nutrition Res. in Developing Countries	WHO	Toronto		1976-78	0.18	1
Poultry Breeding Stocks	Priv. Firm	Guelph	Private Firm	1976-78	0.15	1
*Rural Living and Learning Education for Rural Families in Dev. Countries	FAO	Guelph	Danish Government	1974	0.10	1
*Selection of Drought-Resistant Sorghum	IDRC	Saskatchewan	ICRISAT IDRC	1974-78	1.50	1

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Global (con't)	Sociology of Cultural Exploitation		Queen's		1974-77	0.40	1
	*Special CIDA Advisers in Agriculture	CIDA	Alberta McGill	CIDA	1968-78	10.00	3
	Special Consultant-Educational Technology	FAO WHO	Saskatchewan Guelph		1978	0.06	1
	*Spring Triticale Breeding	IDRC	Manitoba	CIMMYT	1975-76	0.10	1
	Study of Institutional Coopn. Between Canadian and Third World Institutions	CIDA	York		1978	0.10	1
	*Training Course for Developing Country Personnel	IAEA	Manitoba	IAEA	1978	0.10	1
	Training for Agri. and Rural Dev. in Developing Countries	FAO	Alberta	Rural Institution Division of FAO	1975	0.25	1
	*Winter Triticale Breeding	CIDA IDRC	Guelph	CIMMYT	1975-78	0.12	1
	*Workshop in Teaching Methods for Agriculture	CIDA UNESCO	Guelph	Universities	1978	1.20	6
	World Hunger Program of United Nations University	UN Univ.	Toronto		1976-78	0.09	1
TOTAL						**313.67**	

* Projects so designated indicate faculty participation in project implementation; the balance are projects involving professional advice.
* Country or area as designated by respondent.

Notes

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2. World Food Council, *Toward a World Without Hunger: Progress and Prospects for Completing the Unfinished Agenda of the World Food Conference*, World Food Council, United Nations, March 1979, p. 8.

3. International Food Policy Research Institute, *op. cit.*

4. International Food Policy Research Institute, *op. cit.*, p. 45.

5. International Food Policy Research Institute, *op. cit.*, p. 18.

6. World Food Council, *op. cit.*, pp. 5-7.

7. Sterling Wortman and Ralph W. Cummings, *To Feed This World: The Challenge and the Strategy*, Johns Hopkins University Press Ltd., Baltimore, 1978, p. 233.

8. Norma Walmsley, *Canadian Universities and International Development*, AUCC, Ottawa, 1970.

II. Education for Development

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2. C.F. Bentley, "Foreign Aid: Blessing or Blight," *Agrologist*, Volume 8, Number 1, Ottawa, 1978, pp. 25-27.

3. L.A. Pluta and W.J. Kontak, *Transfer of a Development Program to Africa: The Case of the Antigonish Movement*, International Development Review – Focus, Washington, DC, 1976.

4. Information from a meeting of the Association of Faculties and Colleges of Agriculture and Veterinary Medicine, Winnipeg, Manitoba, October 1978.

5. *Ibid.*

6. Norma Walmsley, *Canadian Universities and International Development*, AUCC, Ottawa, 1970.

7. Peter A. Oram, *Training Requirements for Research and its Application – An Overview*, International Food Policy Research Institute, Washington, DC, September 1977; Agricultural Institute of Canada, *Technical Aid in Agriculture and Rural Development for Developing Countries: The Professional Resources Factor*, Agricultural Institute of Canada brief to CIDA, Ottawa, December 1977.

8. Louis Sabourin and Robert J. Moore, *Relevance or Understanding? Canadian Educational Involvement with the Third World*, Canadian Bureau of International Education, Ottawa, 1977, pp. 5-6.

9. Association of Universities and Colleges of Canada and the Royal Society of Canada, *The Role of Canadian Universities in International Development*, Interim Report of the Committee on Behalf of the AUCC and the Royal Society of Canada, July 1977.

10. David C. Neice and Peter H. Braun, *A Patron for the World? Part One: A Descriptive Report of the CBIE Survey of Foreign Students at Post-Secondary Institutions in Canada, 1977*, Canadian Bureau for International Education, Ottawa, 1977, pp. 107-123.

11. *Ibid.*, pp. 124-126, 141-150, and 158-164.

III. The Projects: Past Successes and Future Directions

1. Food and Agriculture Organization of the United Nations, *The Role of Experts in Development Cooperation*, Report to the Seventy-Fourth Session of the Council of FAO, Rome, November-December 1978.

2. James C.M. Shute, *Co-operation Between Universities: Some Indicators of Success from Ghana*, Focus: Technical Cooperation, Number 2, Washington, DC, 1978, pp. 22-25.

3. Memorandum from James C.M. Shute, Director of the Ghana-Guelph Project.

4. Consultative Group on International Agricultural Research, *CGIAR: Consultative Group on International Agricultural Research*, CGIAR, New York, 1976.

5. Alan B. Amey, "The Role of Canadian Non-Governmental Organizations in World Food Supply, 1968-77," *From the Bottom Up: Involvement of Canadian NGOs in Food and Rural Development in the Third World*, Science Council of Canada, Discussion Paper, Ottawa, June 1979.

IV. The Universities and Canadian Professional Expertise

1. Information supplied by Mr. E. Blais, Resources Branch, CIDA.

2. Food and Agriculture Organization of the United Nations, *The Role of Experts in Development Cooperation*, Report to Council of FAO, Seventy-Fourth Session, November-December 1978.

3. Suteera Thomson, *Food for the Poor? The Role of CIDA in Agricultural, Fisheries, and Rural Development*, Science Council of Canada, Discussion Paper, D 80/1, March 1980.

V. The Partners

1. Thomas C. Bruneau, Jan J. Jorgensen, and J.O. Ramsay, *CIDA: The Organization of Canadian Overseas Assistance*, Centre for Developing Area Studies, McGill University, Montreal, October 1978.

2. Canadian International Development Agency, *Strategy for International Development Cooperation, 1975-1980*, Information Canada, Ottawa September 1975.

3. *Ibid.*, p. 25.

4. International Development Research Centre, "Notes for the Appearance of Officials of the International Development Research Centre Before the Standing Committee on External Affairs and National Defence," Ottawa, May 1977.

5. *Ibid.*

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8. National Academy of Sciences, *World Food and Nutrition Study: The Potential Contribution of Research*, National Academy of Sciences, Washington, 1977, p. 17.

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10. NUFFIC, *PUO: A Dutch Programme for University Projects of Development Cooperation*, NUFFIC, May 1977.

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12. Swedish Agency for Research Cooperation, "SAREC's Second Year," *Annual Report 1976-77*, Swedish Agency for Research Cooperation with Developing Countries, Stockholm, Sweden.

13. J.A.S. Walker, *Cooperative International Development Research: Towards an Enhanced Application of Canada's R & D Expertise to Problems of the Developing Countries*, MOSST, Ottawa, June 1979.

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